Marion County
Muscular Dystrophy Foundation

SPECIFICATIONS AND DRAWINGS FOR A WHEELCHAIR LIFT

DESIGNED AND DEVELOPED
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AT
INDIANAPOLIS

U. S. Patent 4,015,725 has issued relative to the wheelchair lift owned by Marion County Muscular Dystrophy Foundation.

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TABLE OF CONTENTS

0.0 Introduction

1.0 Specifications

2.0 Necessary Measurements

3.0 Construction Details

- 3.1 Compression Members
- 3.2 Screw Bearing Assembly
- 3.3 Screw Assembly
- 3.4 Yoke Assembly
- 3.5 Nut Assembly
- 3.6 Guide Book
- 3.7 Intrernal Lift Columns
- 3.8 Lift Platform Assembly
- 3.9 Flop Out Assembly
- 3.10 Mounting the Drive Sprocket
- 3.11 The Motor Mount
- 3.12 The Chain Tightener
- 3.13 The Pins
- 3.14 The Electrical Control Box

4.0 Installation of the Lift

- 4.1 Compression Members
- 4.2 Final Assembly of Yoke & Internal Columns
- 4.3 Yoke Installation
- 4.4 Flop Out Installation
- 4.5 Platform Attachment & Adjustment
- 4.6 Control Box Wiring

5.0 Maintenance

6.0 Operating Suggestions

7.0 Operating Procedure

TABLE OF CONTENTS (continued)

8.0 Sources of Supply

9.0 Material List

10.0 List of Necessary Tools

0.0 Introduction

These notes are to be used as a guide and as a plan for the construction of a patient lift to lift a patient in and out of a van type vehicle. The lift is designed as a safe, low cost, simple device that lifts the patient with assistance of an operator or a driver. When the lift is retracted or is in it's stored position the entire lift apparatus is enclosed inside the van with the minimum of lost space.

Lifts have been constructed to test the various parts of the plans that follow so that performance characteristics could be proven and the reliability of the design verified. If construction details are followed closely, the final result should be satisfactory and the lift constructed should give many years of satisfactory service.

These plans contain only the construction details for a lift to be placed in the rear of a van type vehicle. This design is being promoted because as the years have passed there have been fewer design changes on the back entrances of vans in comparison to the side. It is easier to construct a lift for the rear of a van. We realize this does not help those who want to pull trailers and camp out of your vans, where a side lift would be better. But if you read through the plans, I believe, you will see that with some small modifications these plans can be adapted to fit a side entrance. From our experience, the double door, non sliding door type, side entrance is the easiest to build a lift for. The sliding door vans were the most difficult for us to install a lift in and I believe I would discourage anyone from trying to adapt these plans to a sliding door entrance.

We have also included a list of where we found various materials and parts that we used in the construction of our lifts. These are not the only supplies, but they were convenient for us.

When we undertook this project we thought we would be done in one year. It has taken much longer for a variety of reasons. But time has been helpful, because the quality of the lift described in the following pages is far superior to the first lift we built in that first year. Time brought out problems we had not anticipated and also brought about simplifications and refinements, which increased the reliability of the lift.

We would like to express our thanks to Miss Mary Alice Wilson who lassoed, bridded and gently spurred us on. We also thank the Marion Country Muscular Dystrophy Foundation and the Lilly Foundation for their financial support on this project. The Purdue School of Engineering and Technology at Indianapolis has also been most gracious with space, skill and tools. We would also like to express our thanks to those so many we have meet that carry special burdens with good cheer and unbowed shoulders. It has made an impression that will warm our hearts for many, many years. Good luck on your new project!

TWO POST LIFT FOR THE REAR

1.0 Maximum Specifications

1.1 Design Load - 500 lbs.

1.2 Lift Load - 26 ins.

1.3 Lift Time - 25 seconds

1.4 Platform Length - 38 ins.

1.5 Platform Width - Van door width dependent

2.0 Measurements - Necessary measurements to be taken are illustrated in Figure I and the basic description of the lift components is shown in Figure II.

3.0 Construction Details for the rear mounted lift

3.1 Construction of the Compression Members

a. Cut two pieces of 2 3/16" x 2 3/16" square tubing (1) to length "C"

b. Drill 1/4" dia. holes clear through as shown in Figure III in each member.

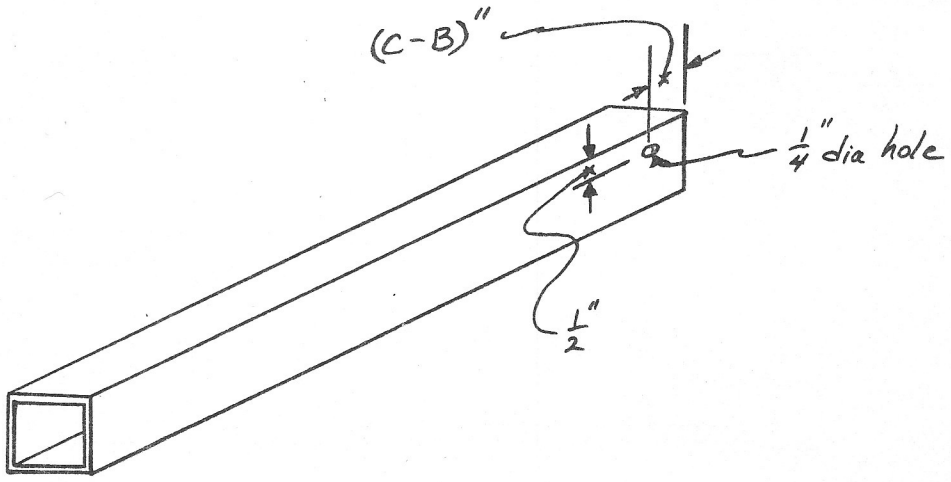


Figure III

Description of the Structural Members

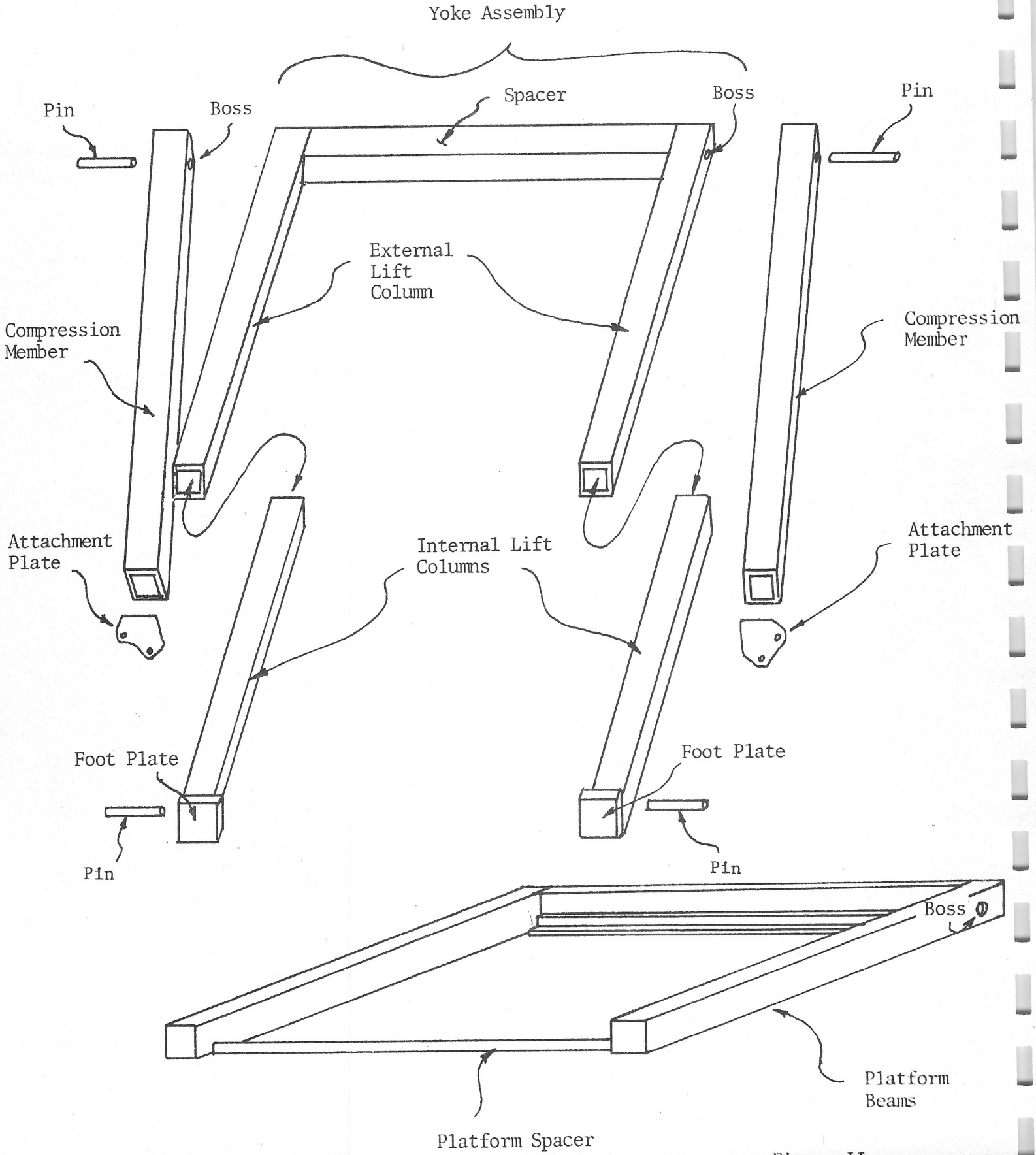


Figure II

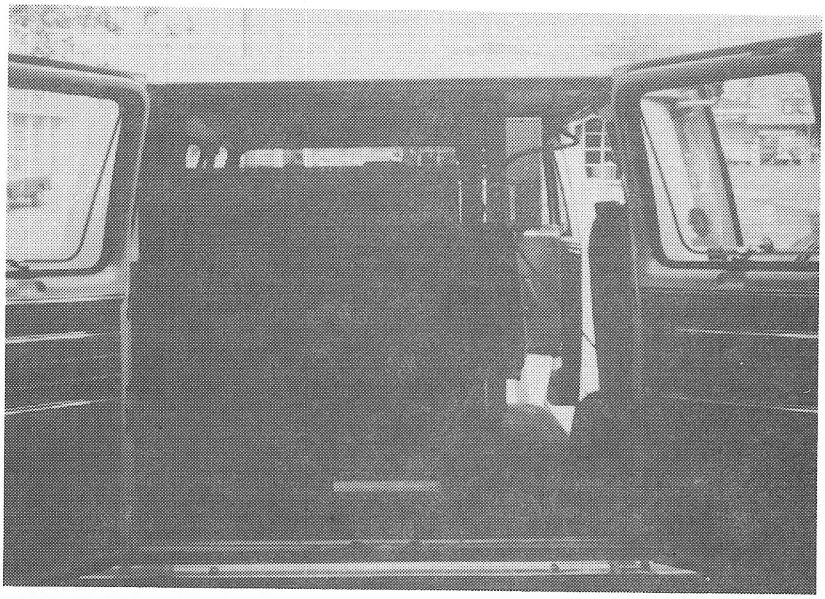


FIGURE 1

FIGURE 2

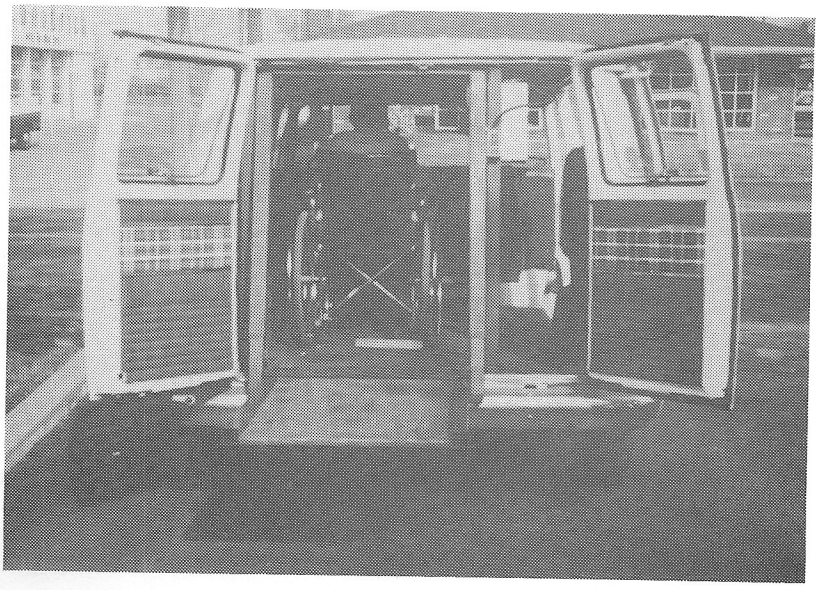


FIGURE 3

FIGURE 4

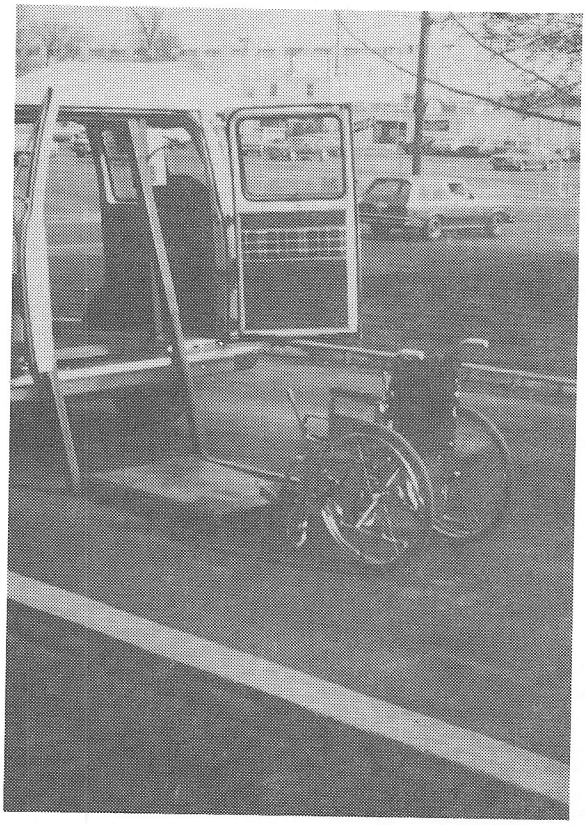
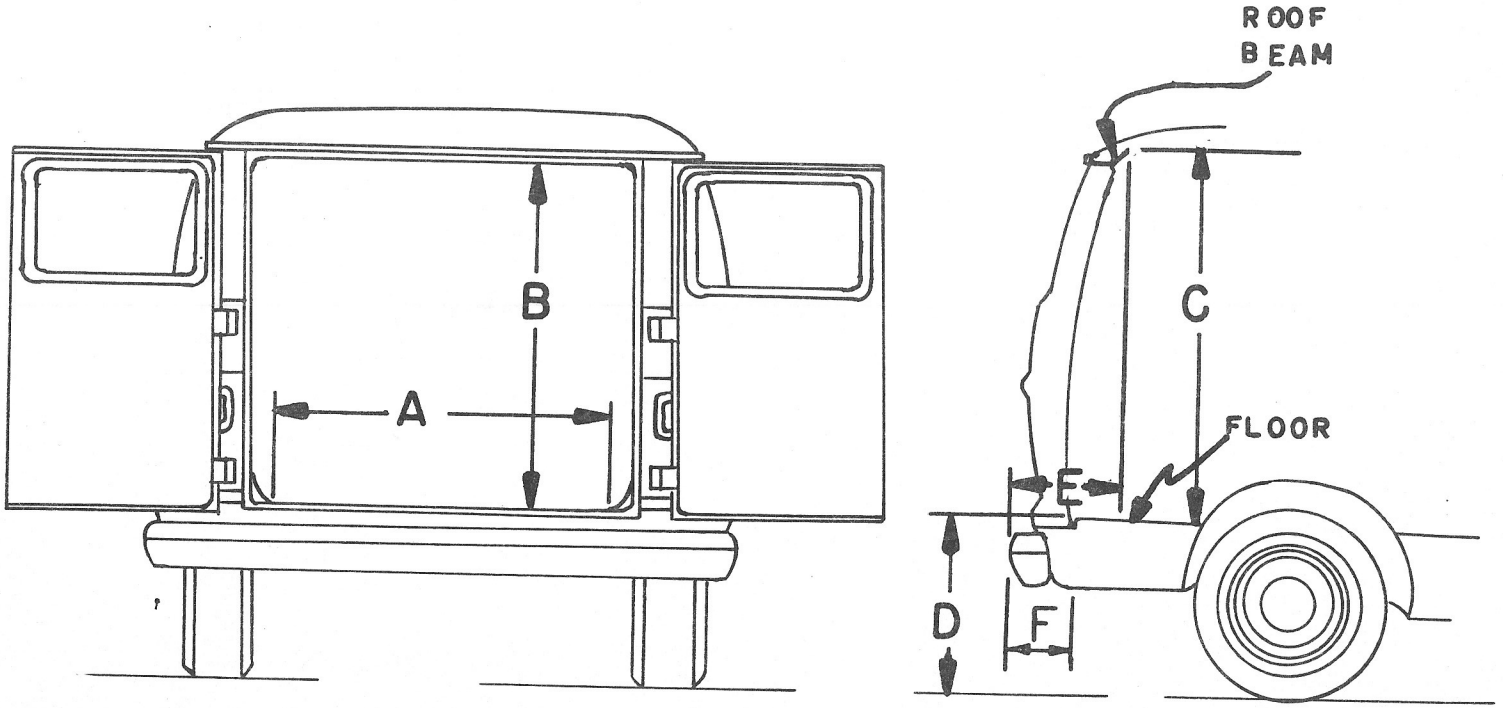


FIGURE 5

DIMENSIONS	INCHES
A	
B	
C	
D	
E	
F	

FIGURE I - Measurements for rear mounted lift



c. Cut two 1" square pieces (Boss) from 1" wide x 1/8" thick steel strap and drill a 1/4" dia. hole in the center as shown in Figure IV.

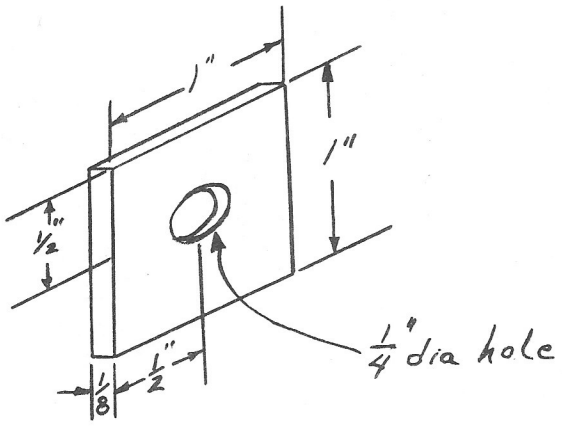


Figure IV

d. Using 1/4" dia. threaded rod attach one boss to each of the members as shown in Figure V. The members are mirror images of each other.

e. After welding the bosses to the members, remove the threaded rods and snag grind or file the welds so that the boss surface is smooth and clear of weld spatter.

f. Drill out the 1/4" dia. holes to 1/2" dia. It is important that these holes be exactly 1/2" in dia., so drill them first to 15/32" dia. and then skin them out carefully with a sharp 1/2" dia. drill starting from the non boss side.

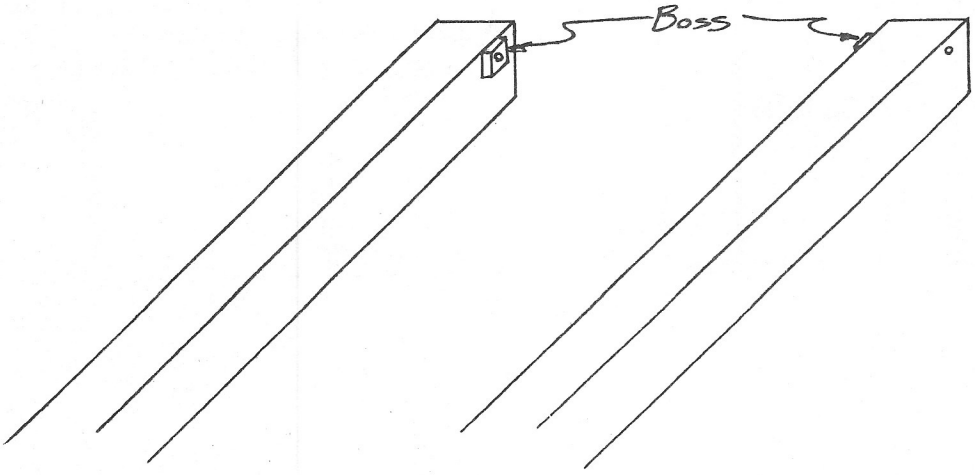


Figure V

g. Set your compression members upright in the back of your van with the bosses on the up end, toward each other, and with the boss next to the roof beam. Lean the tops of the compression member against the roof beam, with the distance A separating the bosses. Check for fit, the center of the boss holes should fall right at the bottom of the roof beam. If they are a little high or low (1/8") it doesn't matter that much at this time. What you must decide is where to place the bottoms of these compression columns. You can leave them in the verticle position or you can slant them with the bottoms toward the back as shown in Figure VI.

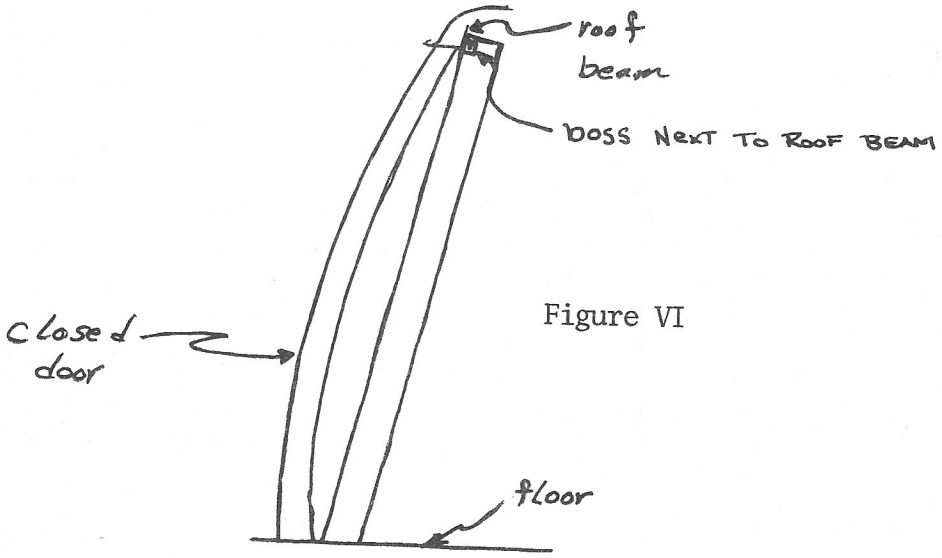


Figure VI

If the compression member is left in the straight up and down position it is easier to mount it in the van. If it is slanted you get a little more usable space in the back of the van and the platform of the completed lift stores a little better. If you slant it check to see if the boss hole stays with its hole center at the bottom of the roof beam. It might be lower. This is no problem since the compression member can be shimmed up on installation. Look at the bottom end of the compression member in whichever position you decide to place it. Decide on how you can attach it to the floor. See Figure VII.

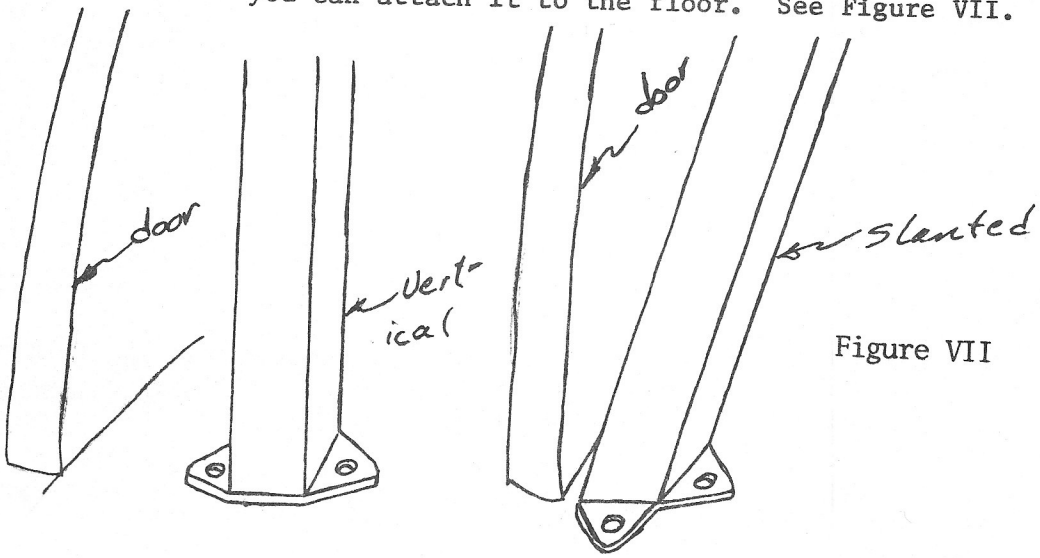


Figure VII

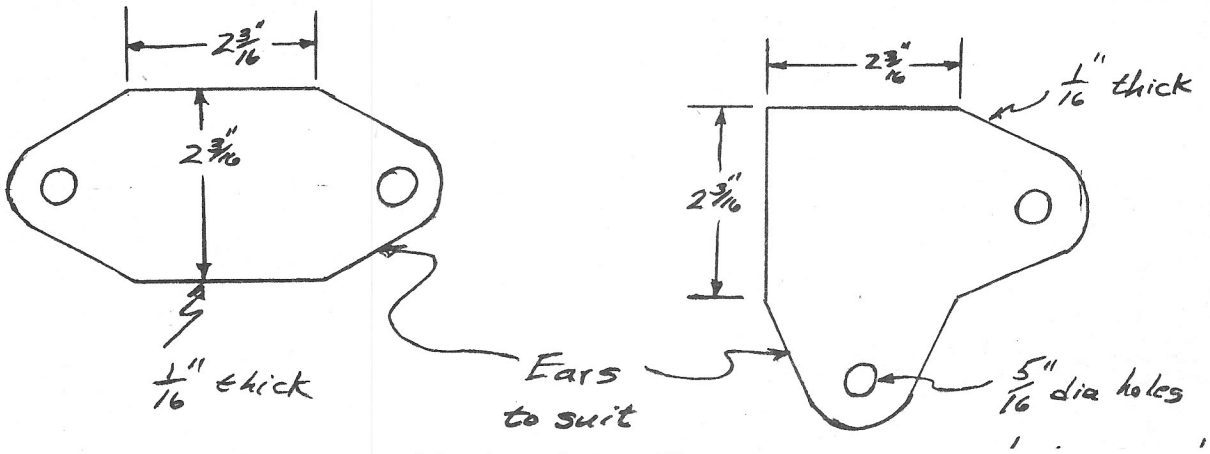


Figure VIII. Possible Attachment Plates

One attachment plate must be made and welded to the bottom for each compression member. What is important is that the attachment plates do not cover any of the floor in between the compression columns. Therefore the bolts that go through the foot pad must be placed to the front or the back or to the outside of the new compression columns. The compression columns are now complete. Do not install them in the van at this time. Before welding on the pads, be sure the bosses are next to the roof beam and facing the center of the door way.

3.2 Construction of the Screw Bearing Assembly

a. Cut out pieces for the screw bearings block assemblies (2 sets required) as shown in Figure IX.

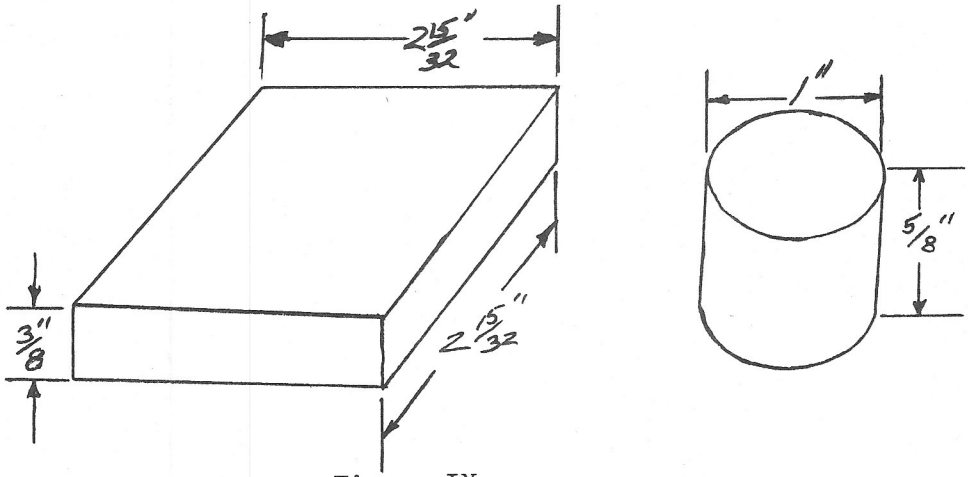


Figure IX

b. Drill a 1/4" dia. hole through the center of the square and the round pieces and assemble with a 1/4" dia. threaded rod and nuts. As shown in Figure X and weld.

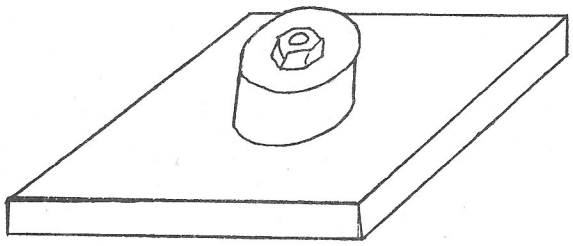


Figure X

c. Remove the threaded rod from the welded assembly and drill the 1/4" dia. hole out to 3/4" dia. Again be careful that you drill out to 23/32 first and then skin out to 3/4" dia. with a sharp drill.

d. Press the bronze oil filled bushings (5) into place and set the assembly aside.

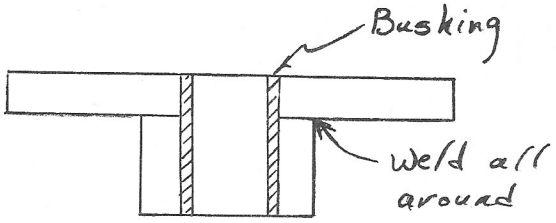


Figure XI

3.3 Construction of the Screw Assembly

a. Cut two 1/2" dia. - 13 thread screws (7) to a B-2" length.

b. Cut two pieces of 1/2" inside diameter, 5/8" outside dia. bushing stock 2 7/32" long.

c. Drill two 1/4" dia. holes through the steel bushings as shown in Figure XII.

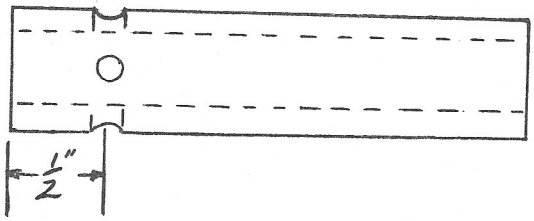


Figure XII

d. Assemble the steel bushings onto the screws as shown in Figure XIII and braze the bushing to the screw through the holes.

3.3 Construction of Screw Assembly

a. Ok
b. Measure the thickness of the thrust bearing (3), the sprocket (4) and the screw bearing assembly as shown in Figure XI a.

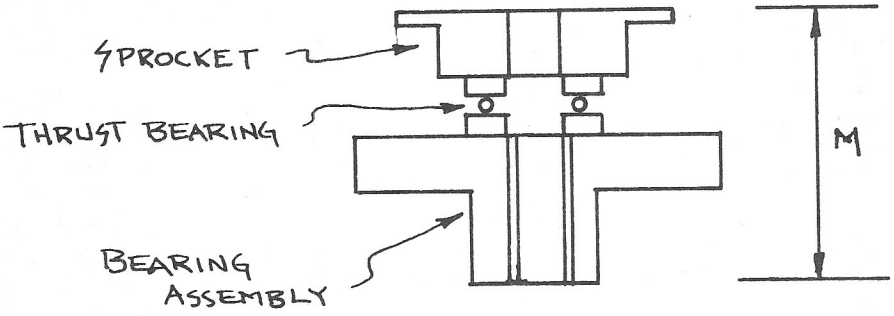


Figure XI a

Cut two pieces of 1/2" inside diameter, 5/8" outside diameter bushing (6) stock (M + 1/16") long.

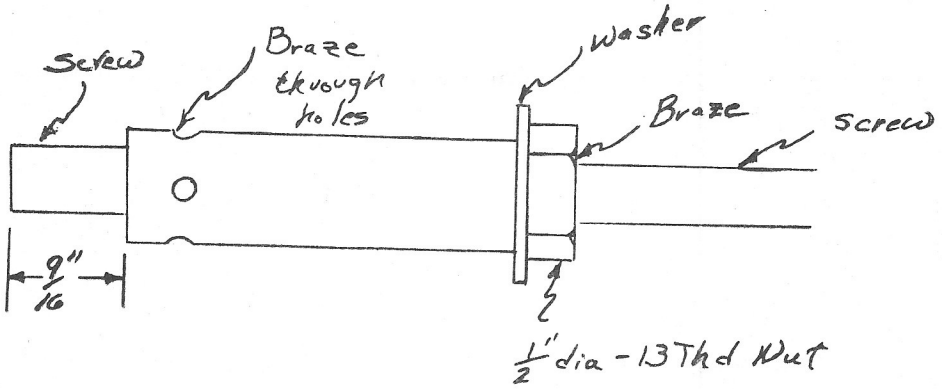


Figure XIII

e. Remove the excess brazing material from the steel bushing with a flat file and set the assembly aside.

f. Try to slip the screw bearing assembly over the steel bushing. It will probably not slip on. The bushing is likely to be slightly undersized. Protect the screw and place it in a vice and use abrasive cloth to reduce the outside diameter of the steel bushing until it will slip into the bronze bushing. Remember to carefully clean the abrasive from the sleeve before you test for fit.

3.4 Construction of the Yoke Assembly

a. The spacer is cut from 2 3/16" square tubing and is A - 5 1/4" ----------long.

b. The two external lift columns are cut from 2 1/2 square tubing. Each column is cut B + 1/2" long.

c. The spacer can be cut as shown in Figure XIV to give a little bit better head room if you have access to a metal cutting band saw.

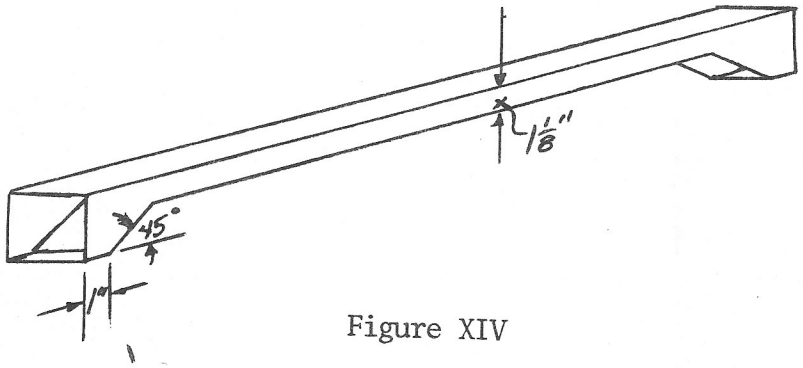


Figure XIV

d. The bottom end external lift columns must be cut as shown in Figure XV.

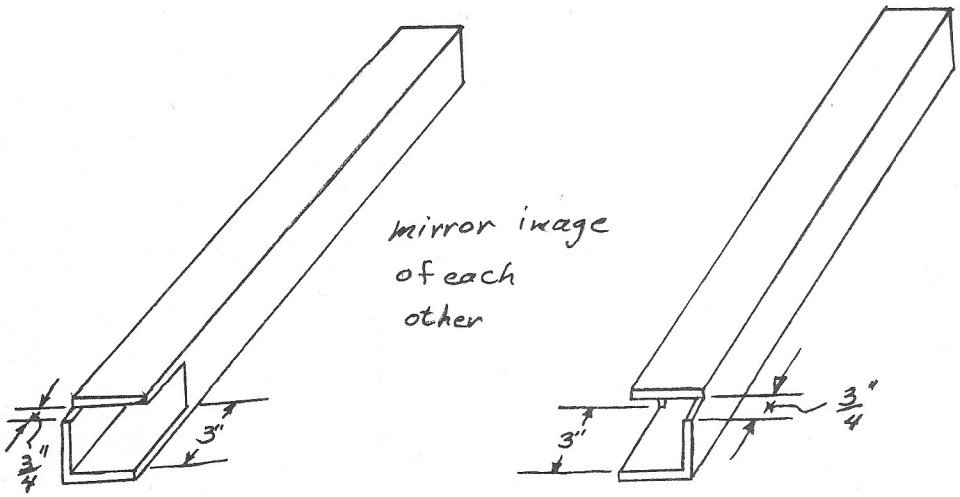


Figure XV

Most of this can be done with a hand hacksaw but it takes some time. The best way is to cut as follows in Figure XVI.

1) Cut with a hacksaw

2) Drill a series of holes close together

3) Use a hammer and small chisel to remove the piece, chip off metal and file to a smooth edge. PROTECT YOUR EYES.

4) Roll the piece one way or the other and saw the 3/4" cut and you are done.

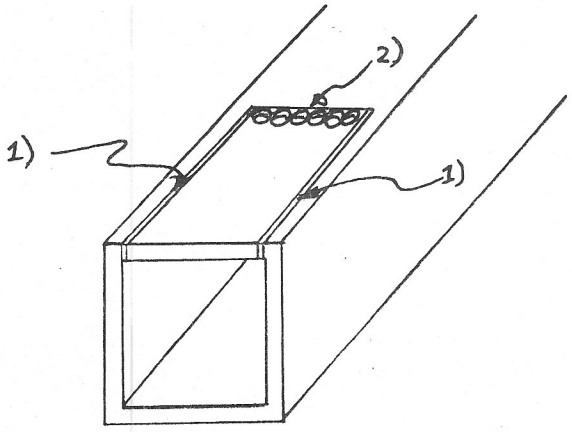


Figure XVI

e. Drill a series of 3/8" dia. holes as shown in Figure XVII 1 1/8" from the other end.

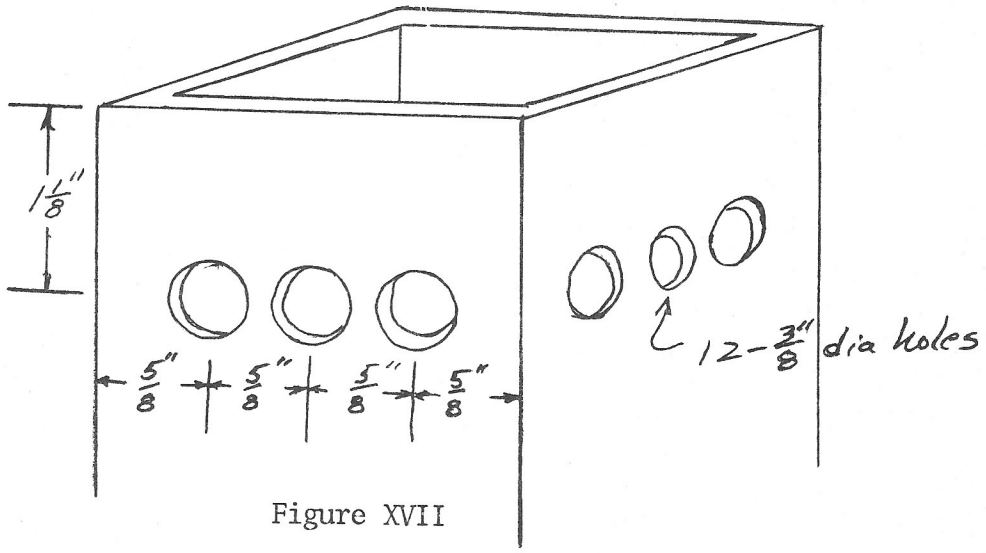


Figure XVII

f. You are now ready to weld the screw bearing assembly completed in 3.2 d in place. The bearing is held in proper alignment by use of the screw assembly as shown in Figures XIX and XX. The bearing assembly is held in place by welding through the holes. Tack weld each side, first checking alignment each time the tube is rotated. When tacking is completed remove the screw assembly from the bearing and complete the welding through the holes.

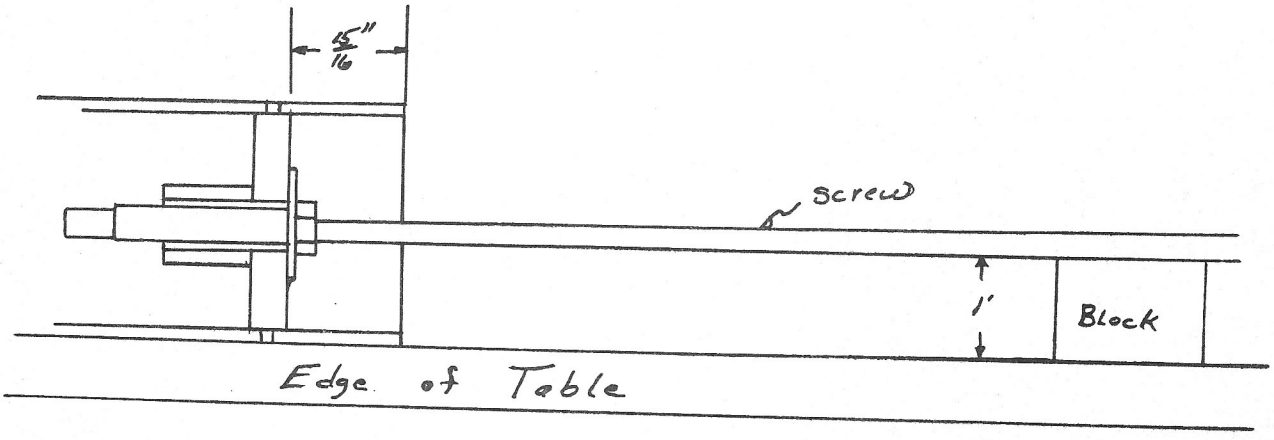


Figure XIX

g. Place the external lift column on the table as shown in Figure XXI and drill 1/4" dia. hole through top side.

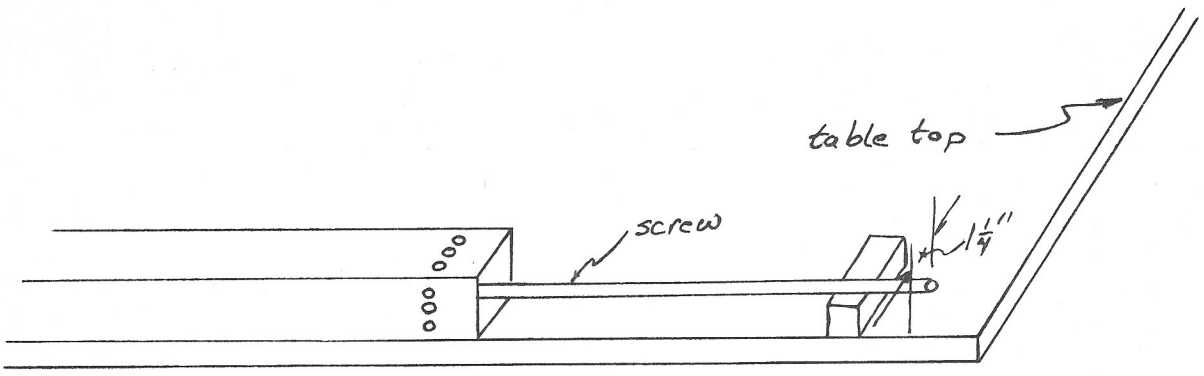


Figure XX

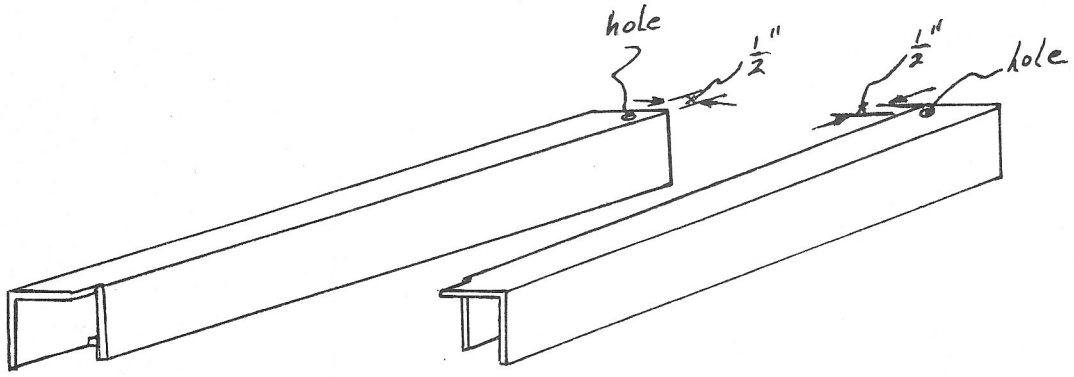


Figure XXI

h. Make two bosses as described in 3.1., c and attach to the external lift column and weld as shown in Figure XXII.

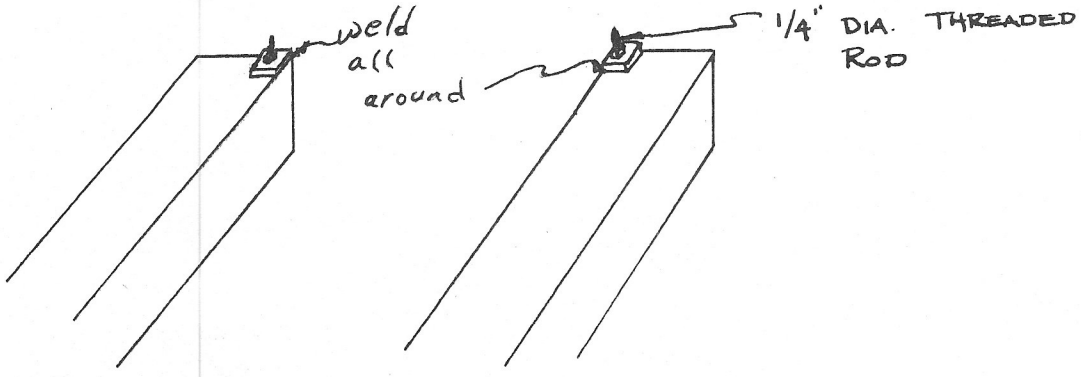


Figure XXII

i. After welding, remove the fasteners and drill the hole out to 15/32" dia. and finally to 1/2" dia. Grind or file off all the weld material that protrudes above the surface of the boss.

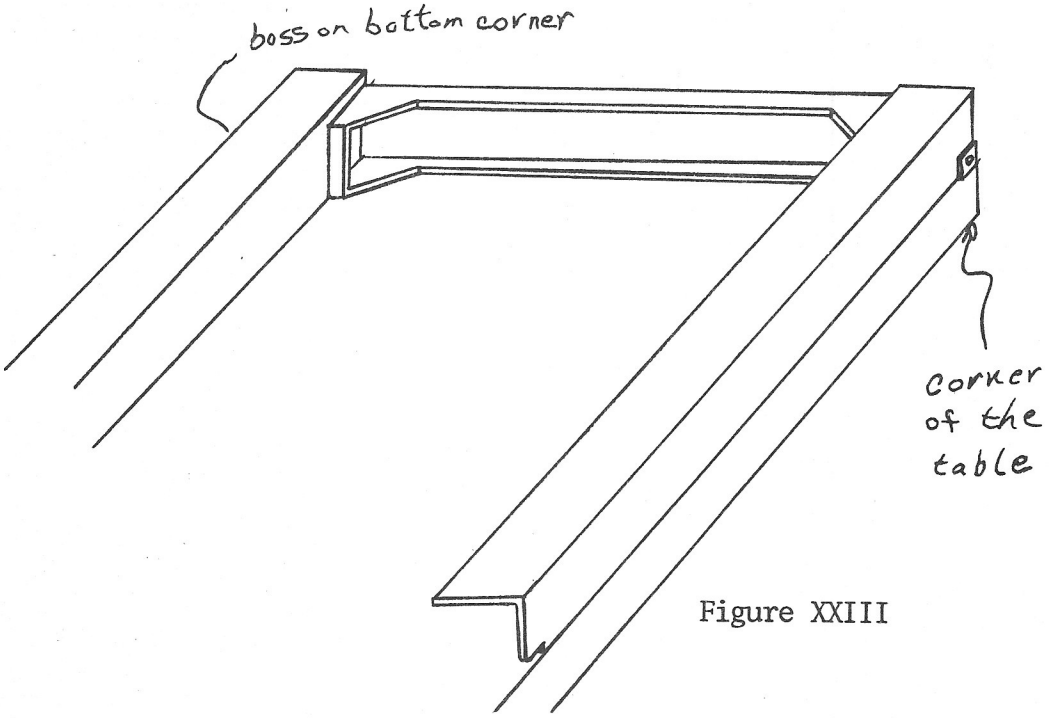


Figure XXIII

j. Lay the external lift columns on a table with boss ends lying in one direction. The boss should be next to the table surface and away from each other as shown in Figures XXIII and XXIV with the spacer placed in between the two external lift columns.

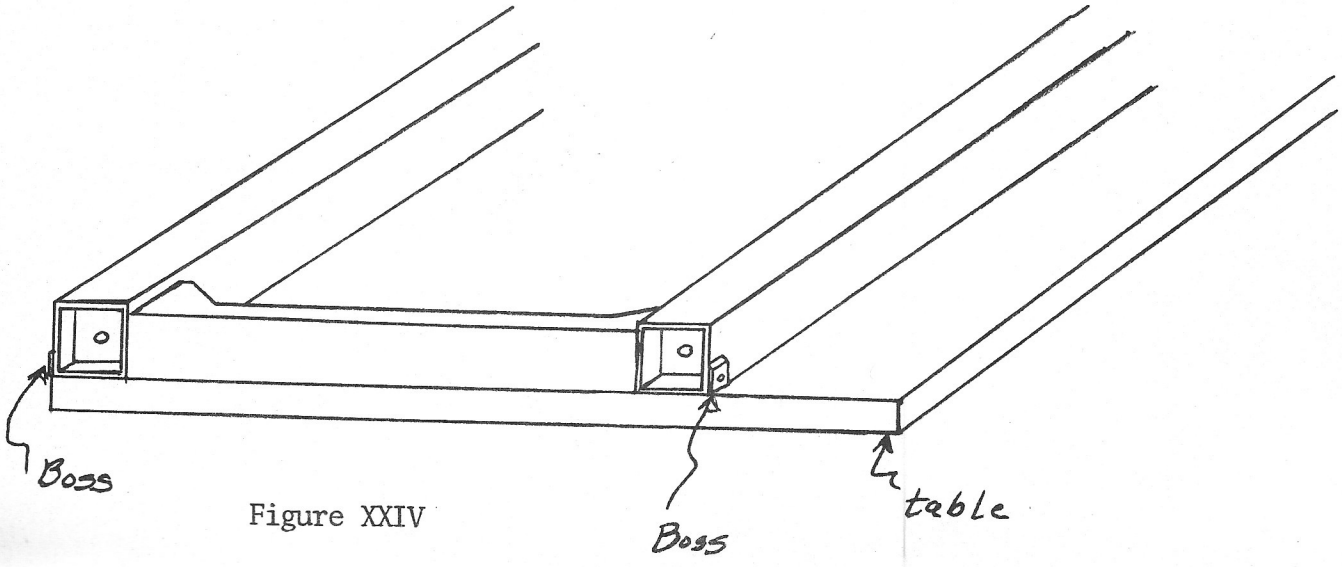


Figure XXIV

k. Tack weld the spacer to the external lift columns on the top and sides. Then roll it over and tack the other side. Check the assembly for flatness and measure across the tacked end from side to side and compare with the distance across the other ends. They must be parallel. Finish welding. Check for parallelism of the external lift columns again. If they are not the spacer can be sprung a little to make them parallel. The width from one end to the other should be within 1/16" of an inch. It is better that the open end be a little narrower than the spacer end. This is because it can be sprung out a little.

1. Lay the welded yoke on the table as shown in Figure XXIII. The top surface is what you will see from inside the van after the yoke has been put into place. You must decide which side you are going to mount the drive motor on, the right or the left. Whichever, drill and tap holes in the top end of the external lift column as shown in Figure XXV for the motor mount.

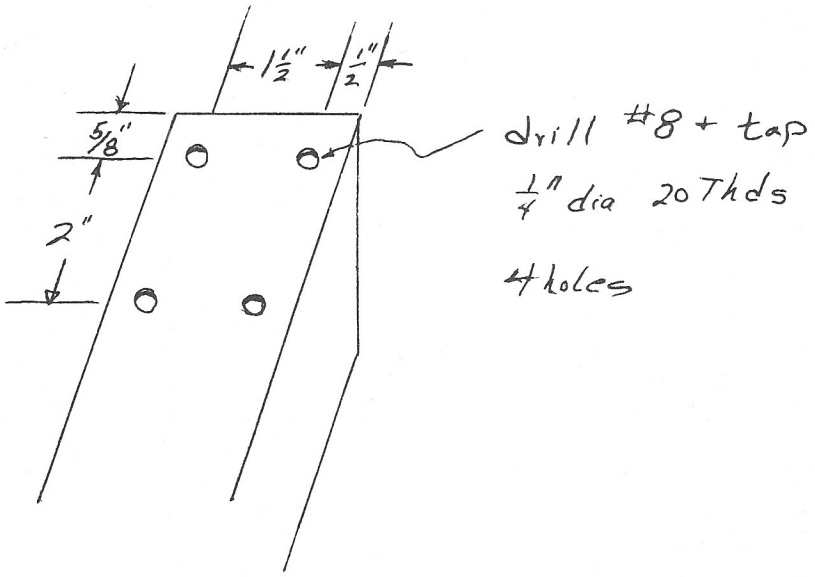


Figure XXV.

3.5 Construction of Nut Assembly

a. Cut out two steel pieces as shown in Figure XXVI and drill a 3/4" dia. hole through the middle.

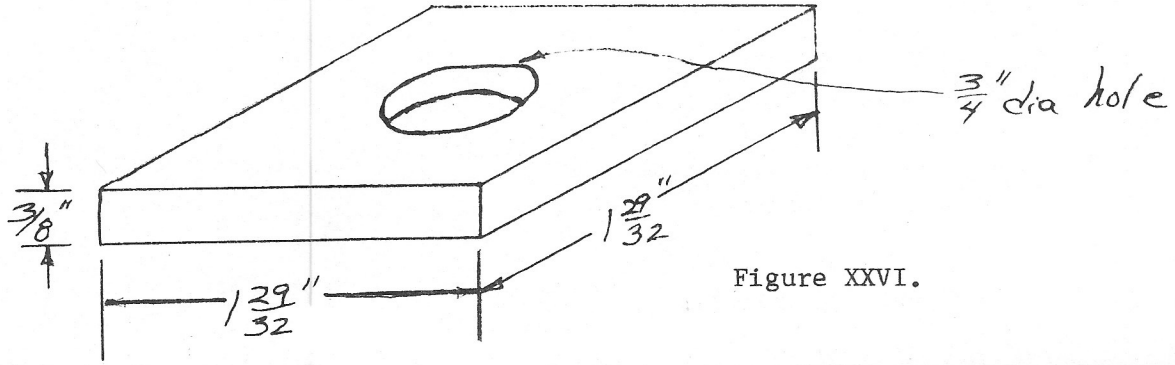


Figure XXVI.

b. Center the oil filled porous bronze bushing (&) in the hole and braze as shown in Figure XXVII.

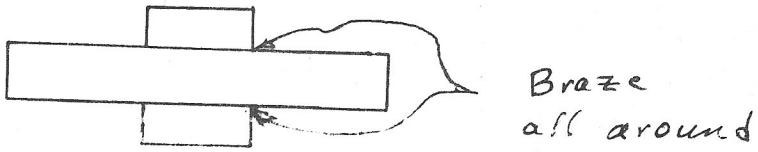


Figure XXVII

c. After brazing the nut assembly drill the hole in the bushing out to 26/64" dia. hole and tap to 1/2" dia. 13 thds.

3.6 Construction of the Guide Blocks

a. Take a piece of wood, an old two-by-four would be suitable, and cut four pieces 1 29/32 inches square.

b. These blocks are to be used to support two plastic golf club handle tubes, usually sold at sporting goods and drug stores. The purpose of these tubes is to prevent the screw from whipping below the nut as it turns and banging around inside the internal lift column.

c. Measure the outside diameter of tubes below the ribbed top and drill a hole normally 1 1/4" dia. through the center of the blocks so the tube slides in with a snug fit as shown in Figure XXVIII

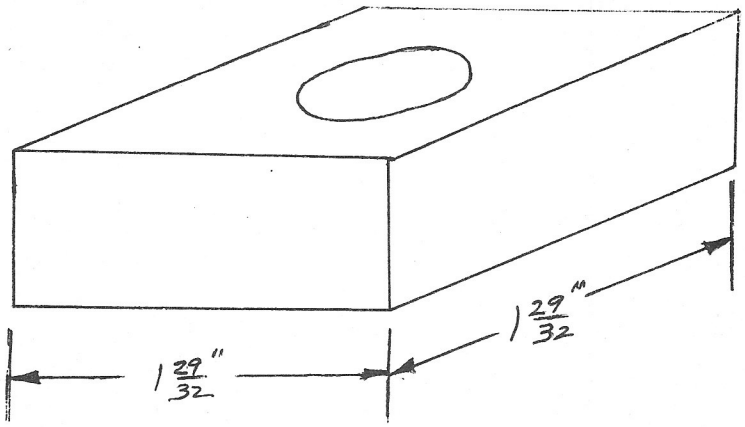


Figure XXVIII

3.7 Construction of the Internal Lift Columns

a. Cut two pieces of 2 3/16" square tubing B-2 1/2 in. long.

b. Compute B/(E+2 1/2") = _____ and compare with table I to select the closest whole degree angle of cut, for the bottom end of the internal lift columns as shown in Figure XXIX.

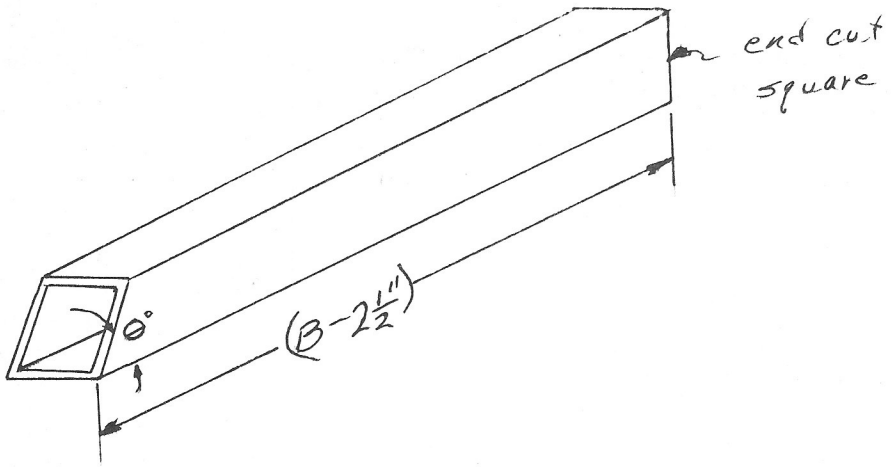


Figure XXIX

Table I

B/(E+2 1/2)	Angle of cut degrees	B/(E+2 1/2)	Angle of cut degrees
57.29	89	5.14	79
28.64	88	4.70	78
19.08	87	4.33	77
14.30	86	4.01	76
11.43	85	3.73	75
9.51	84	3.49	74
8.14	83	3.27	73
7.12	82	3.08	72
6.31	81	2.90	71
5.67	80	2.75	70

c. Construct the internal supports as shown in Figure XXX. Two are required, one for each internal lift column. Also two additional can be made for later use in the construction of the lift platform.

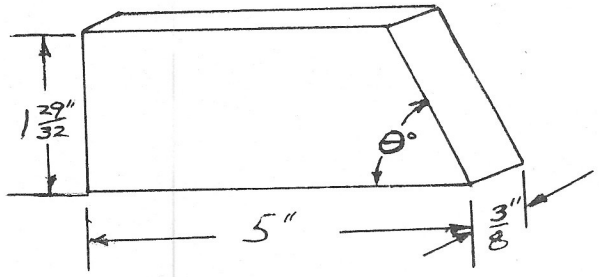


Figure XXX

d. Drill as shown in Figure XXI in the inside of the internal lift columns

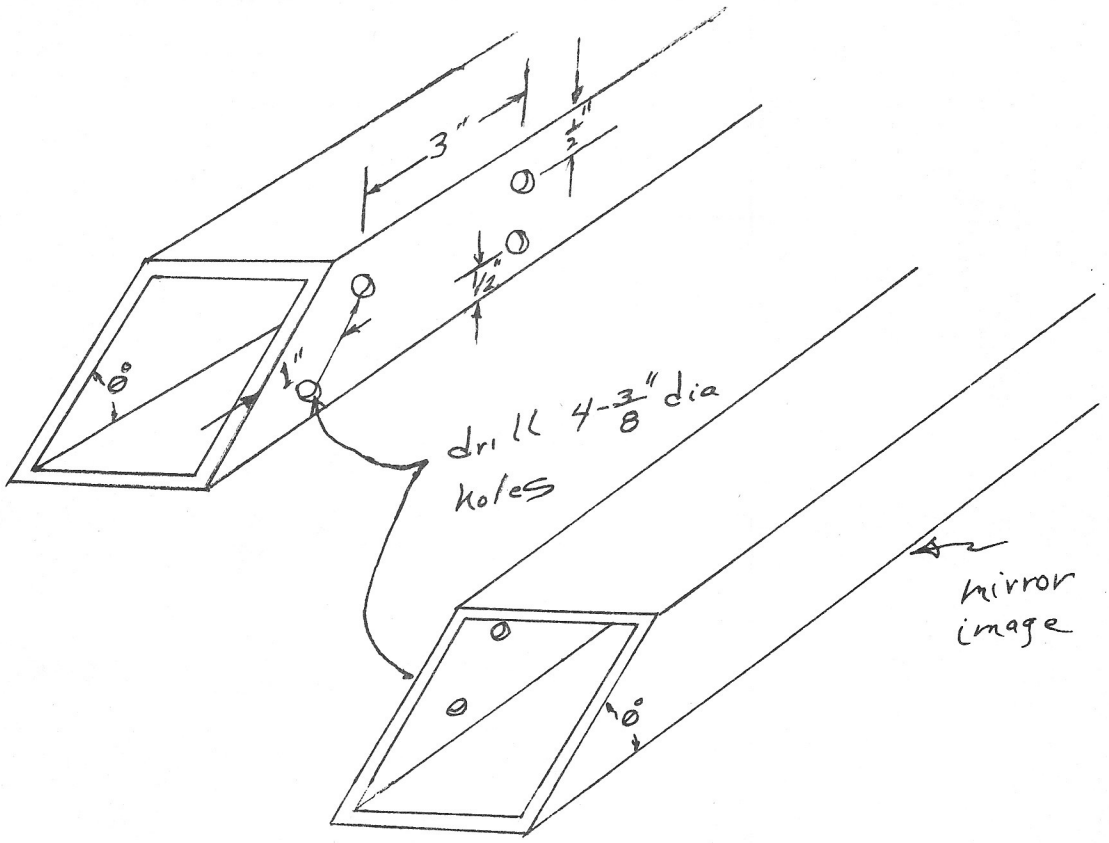


Figure XXXI

e. Place the internal supports in the lower end of the internal lift column as shown in Figure XXXII, clamp in place and weld them in through the holes. Remove the clamps and lay a bead on the inside of the tube as well. You might have to grind the corners off a little on the internal supports to get a snug fit before the welding

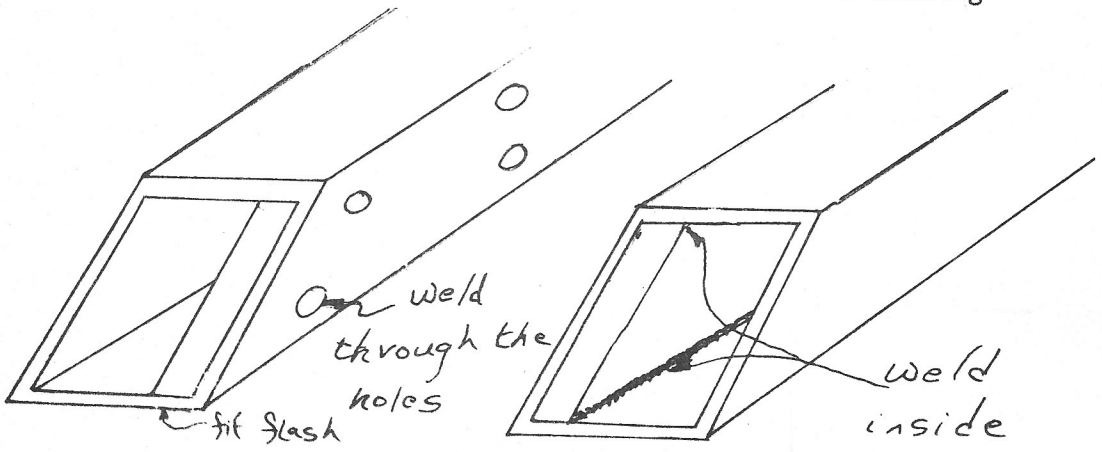


Figure XXXII

f. After the welding remove the excess weld material from around the holes so there will be no interference when the internal lift column is slid up into the yoke.

g. Drill 8 1/16" dia. holes in each column as shown in Figure XXXIII.

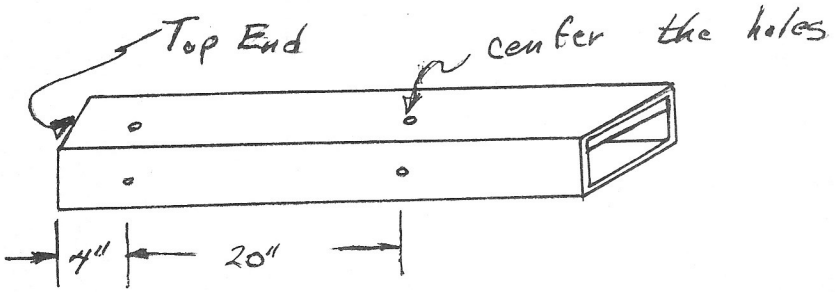


Figure XXXIII

h. Slide the guide blocks into place and fasten with wire brads through the holes drilled in "g", as shown in Figure XXXIV.

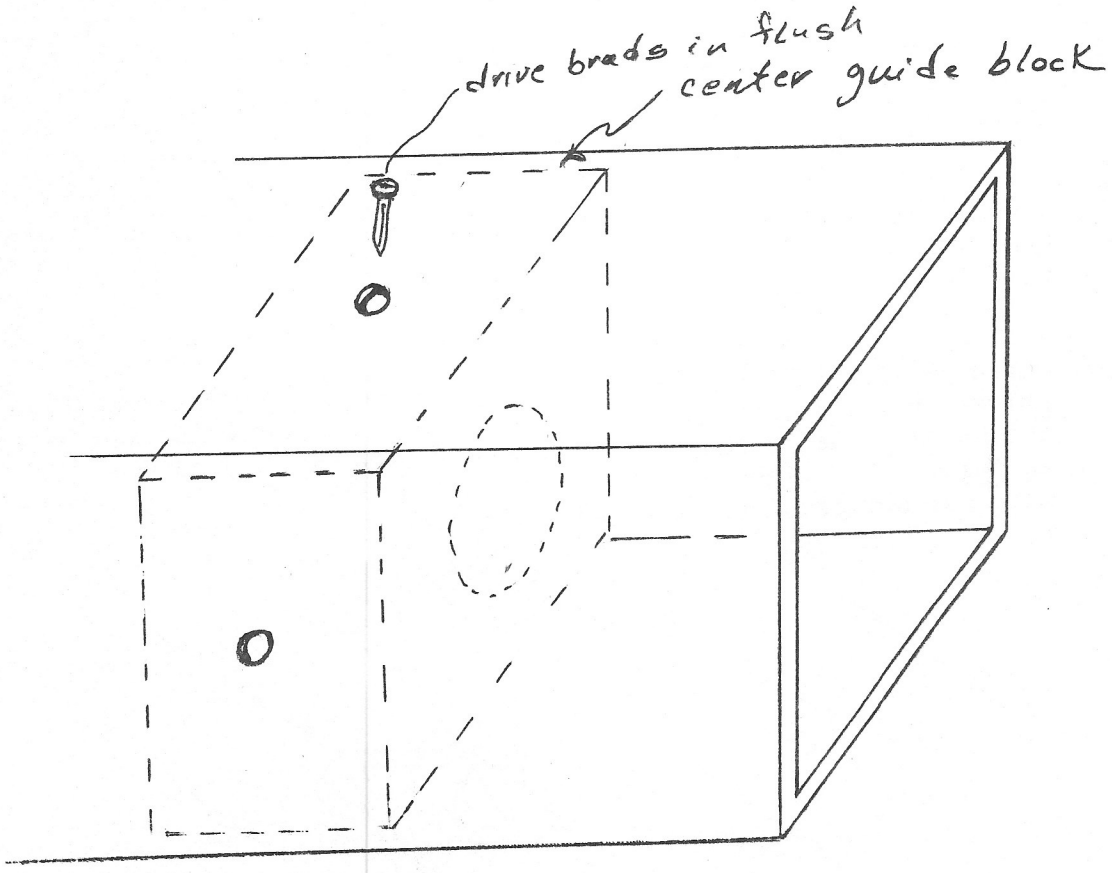


Figure XXXIV

i. Slide the golf handle tube into place with the large rolled end pressed down against the upper guide block (the block next to the square end).

j. Lay the internal lift columns on and along the edge of a table as shown in Figure XXXV. Slip a one foot length of tubing over the threaded rod and screw the rod into the nut assembly. Slip the nut assembly into place, so that its upper surface is 13/16 inch from the open end. Block up and position the threaded rod to ensure proper alignment for welding. Slide the tube on the threaded rod down to the top of the nut. This will protect the threads from weld spatter. Tack weld, check for alignment and then finish weld.

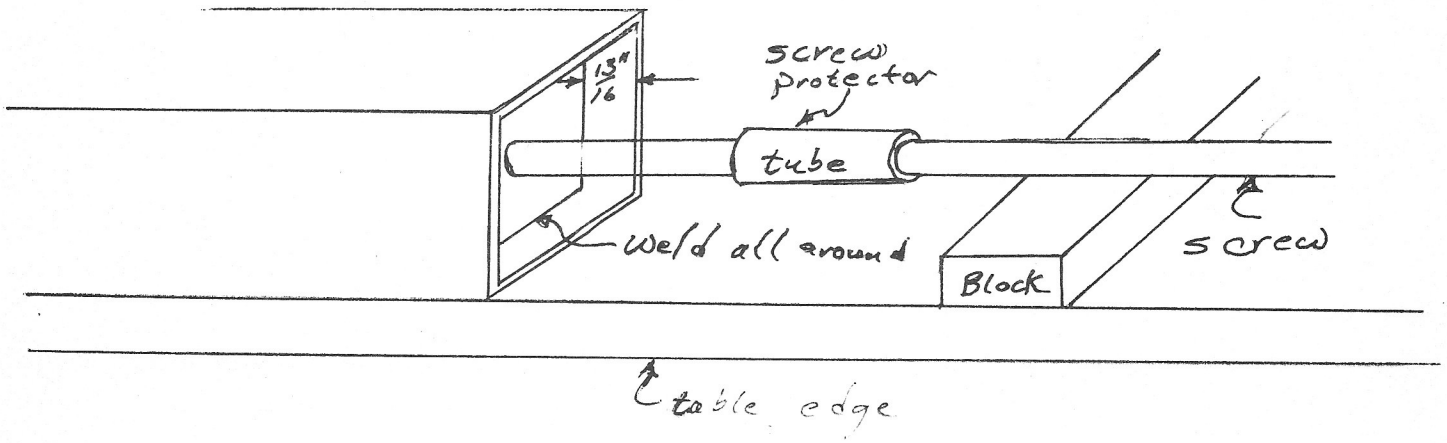


Figure XXXV

k. Lay out and drill a 1/4 inch dia. hole on the inside of the columns as shown in Figure XXXVI. Drill the hole through both sides. Lay out the opposite side as the mirror image.

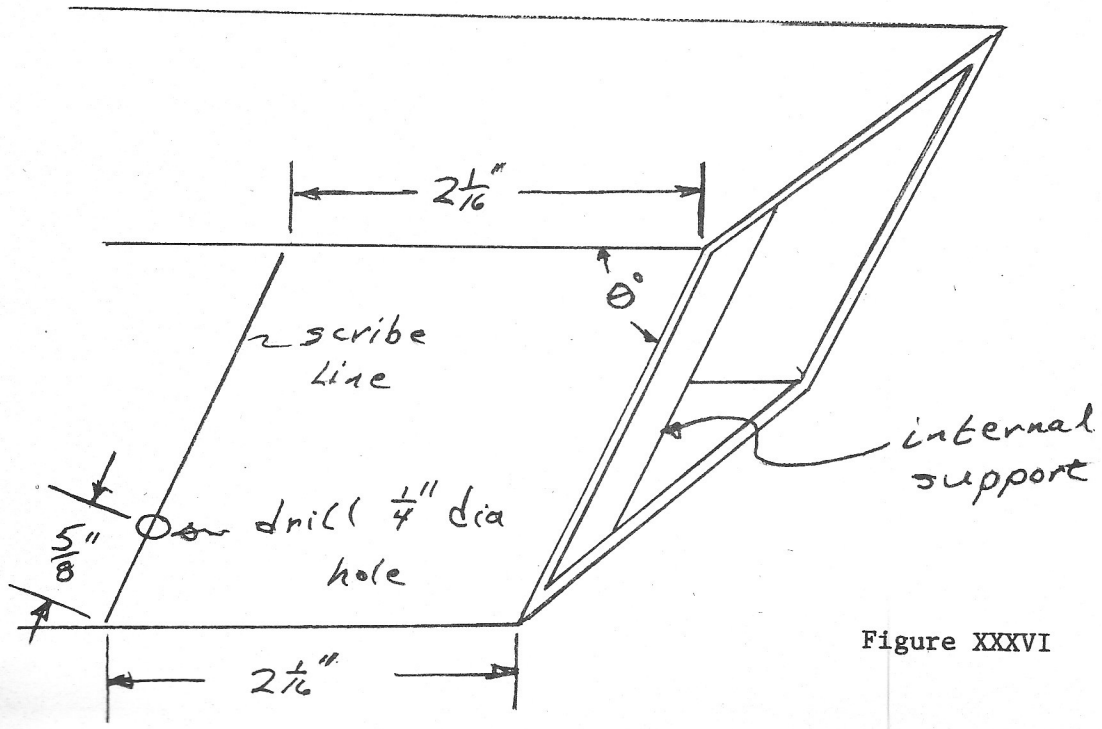


Figure XXXVI

1. Weld a one inch square 1/8 inch thick boss in place on the inside following the procedure used in 3.1 c through f.

m. Cut from 3/8 inch thick steel two foot pads as shown in Figure XXXVII.

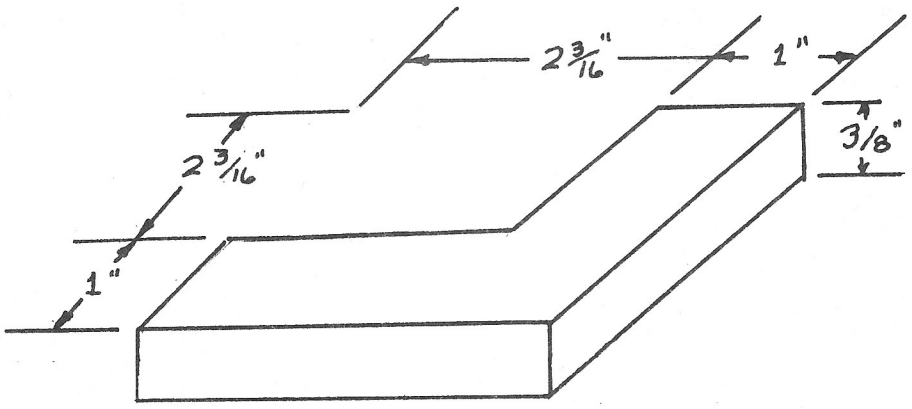


FIGURE XXXVII

n. Weld the foot pads to the bottoms of the internal lift columns as shown in Figure XXXVIII. (mirror image again!)

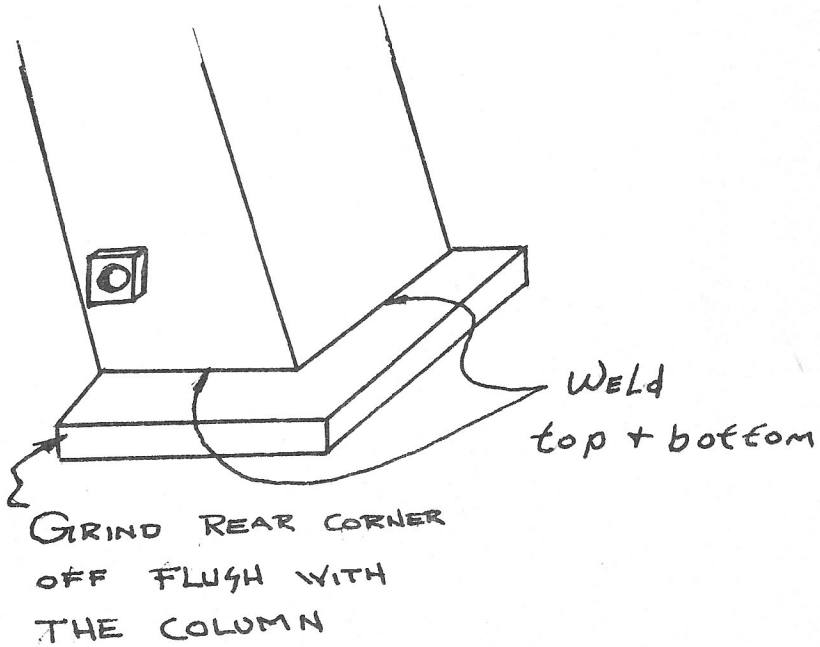


FIGURE XXXVIII

a. Determine the platform length "L". Figure XXXIX shows the platform length required for lifting the patient facing in either direction. Figure XL shows a shorter platform length for when the patient always backs out of the van and enters forward faces the back. The advantage of this shorter platform is less weight and it requires less effort to fold a lighter platform.

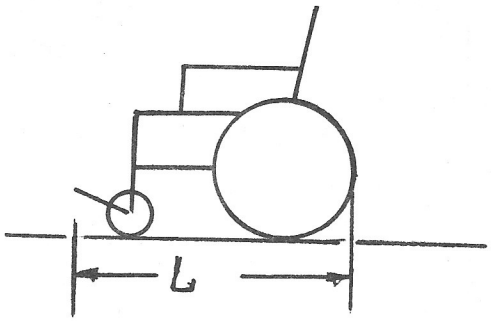


Figure XXXIX

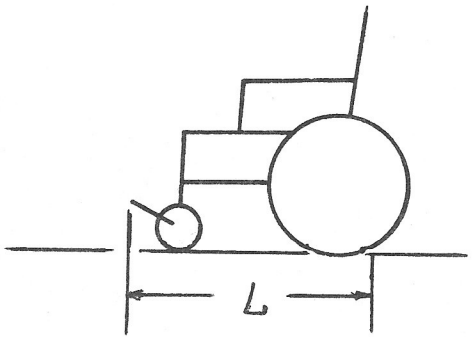


Figure XL

b. Cut two platform beams as shown in Figure XLI.

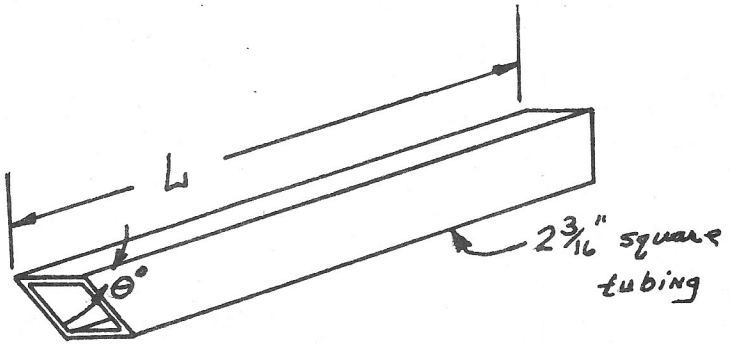


Figure XLIV

c. Using the same technique as described in 3.7, c through f weld in the internal supports into the platform beams. Remember mirror image as shown in Figure XLII.

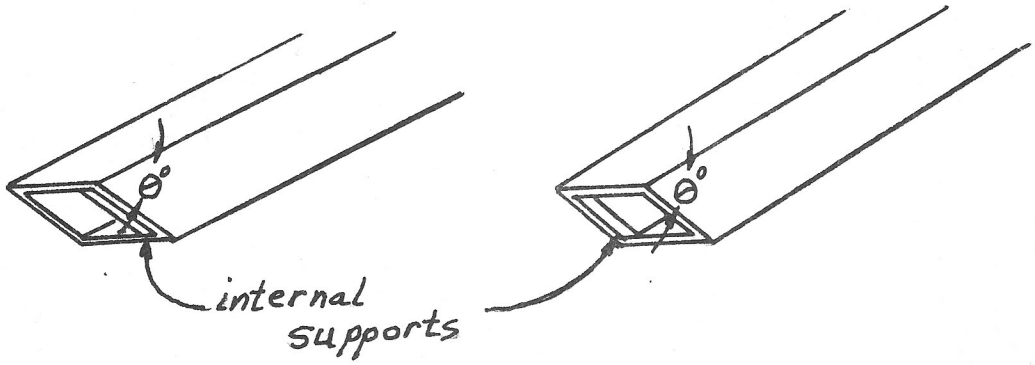


Figure XLII

d. Locate and drill 1/4" dia. holes clear through as shown in Figure XLIII.

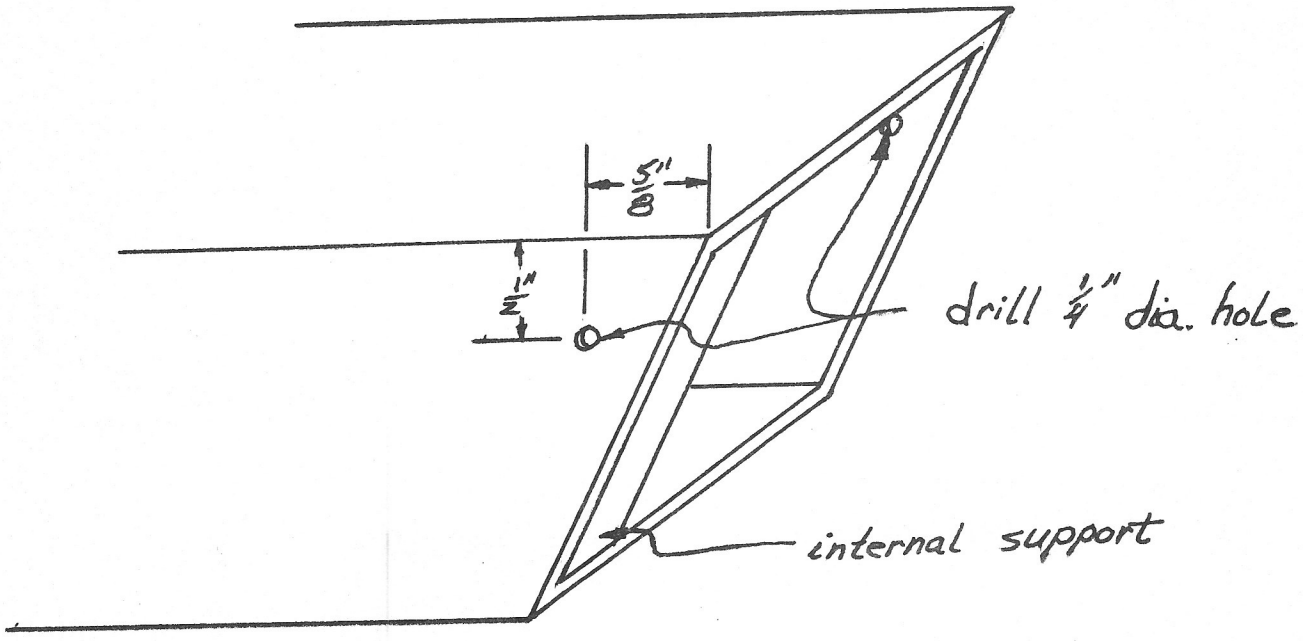


Figure XLIII

e. Attach and weld a boss on the internal support side of each internal lift column. When welding is complete debur, redrill 31/64" and finally to 1/2" dia. hole.

f. Cut a platform spacer from 2 3/16" square tubing A-(9 7/8)" = _____long.

g. Place the two platform beams and the platform spacer on the welding table and weld as shown in XLV.

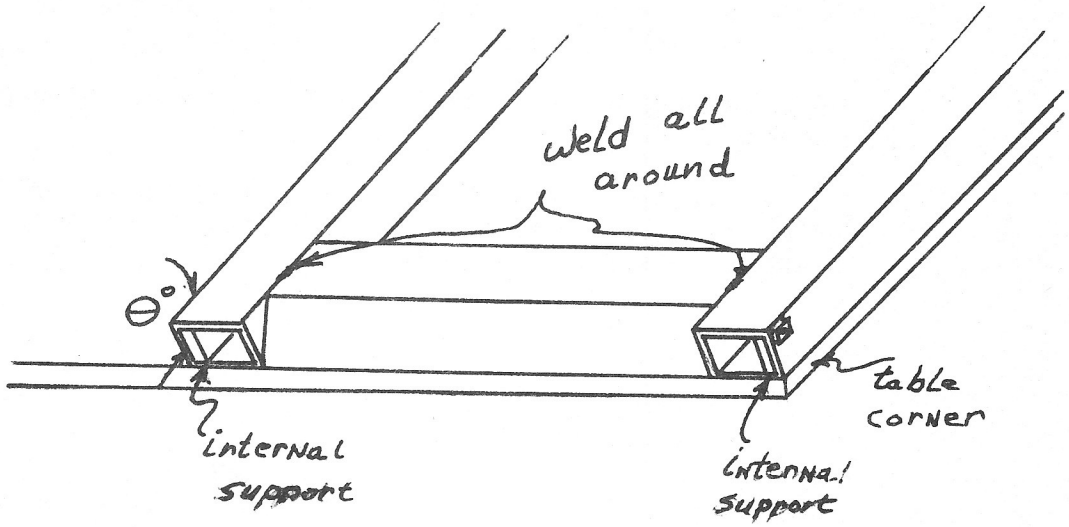


Figure XLV

h. From 3/4" x 3/4" x 1/8" angle iron and 1/2" x 1/2" x 1/8" angle iron cut one piece each A - 9 7/8" long. Also from the 3/4 x 3/4 x 1/8" angle iron cut 6 pieces 6" long and weld into place as shown in Figure XLVI.

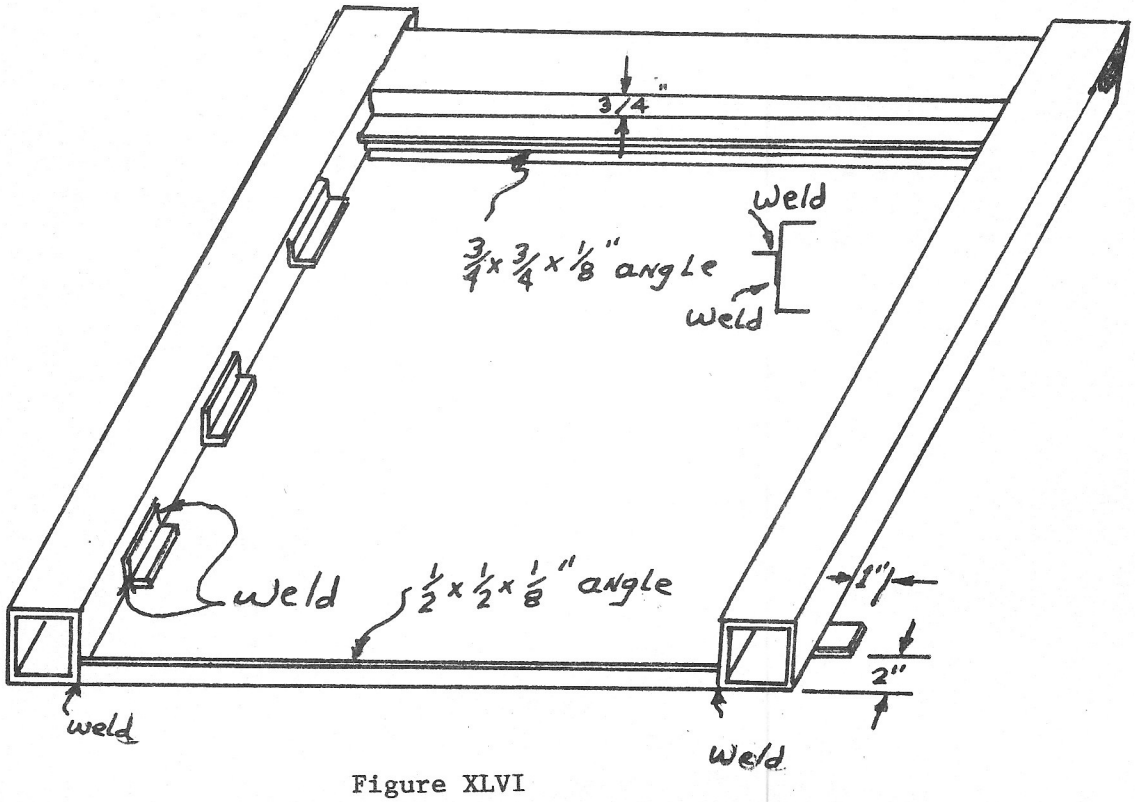


Figure XLVI

From figure XLVI the large angle iron is used to support the platform made from 3/4" thick exterior plywood in the back with the "L" inverted. The small angle iron is on the leading edge of the platform with the "L" upright.The smaller pieces are welded at a slight angle from the front to the back so that the platform is supported on the sides.

i. The platform is cut A- 9 7/8" wide and approximately L- 2 5/16" long. Best thing is to measure. Slots will have to be made in the side edges a to slip past the upright portion of the angle iron.

j. Drill and tap holes in the angle iron to fasten the plywood to the angle iron supports.

k. Cut a piece of iron as shown in Figure XLVII and weld it to the bottom of one of the platform beams as shown in Figure XLVI. This little tab prevents the platform from folding too far.

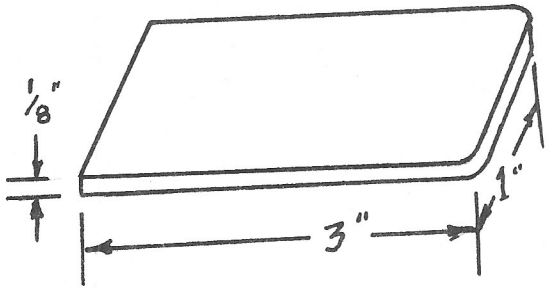


Figure XLVII

3.9 Construction of the Flop Out.
The primary purpose of the flop out is to pivot the platform outward so the platform and the internal lift columns will clear the bumper. The secondary purpose of the flop out is to act as a floor bridge between the lift platform and the van floor. A sketch is shown in Figure XLVIII.

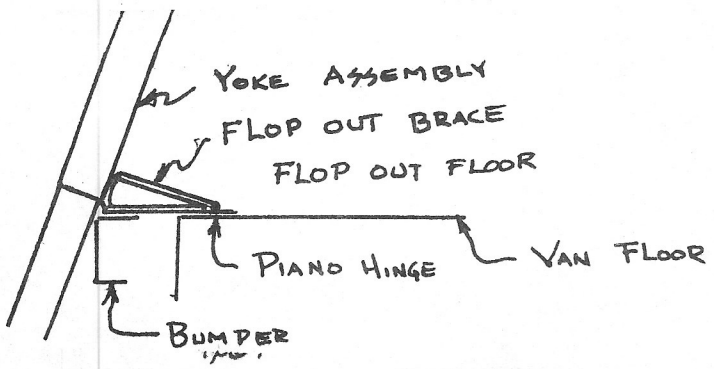


Figure XLVIII

a. The flop out floor is cut from 1/8" thick steel sheet as shown in Figure XLIX

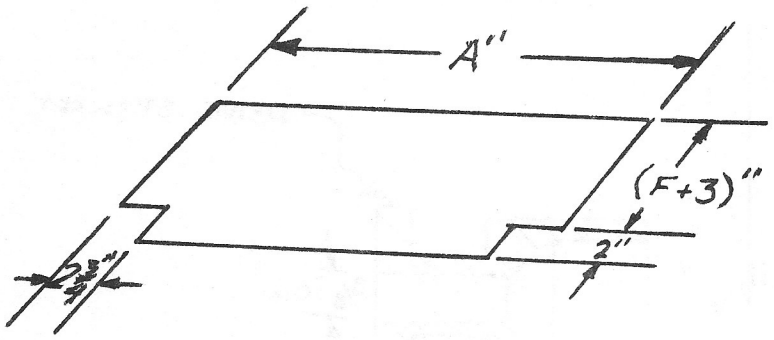


Figure XLIX

b. Two flop out braces are formed from 3/]6" thick 1" wide strap as shown in Figure L.

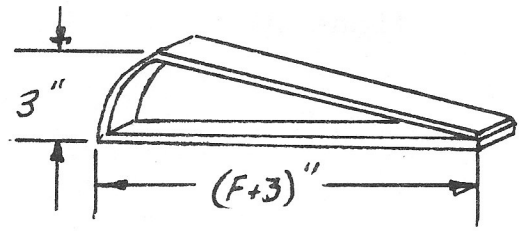


Figure L

c. The flop out braces and a piano hinge are welded to the flop out floor as shown in Figure LI.

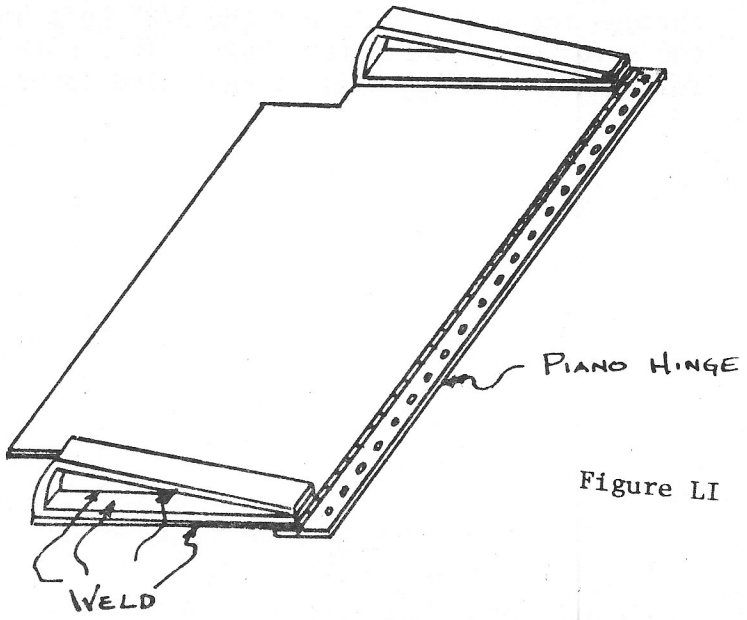


Figure LI

3.10 Mounting the Drive Sprocket (9)

a. Drill the large end of the sprocket as shown in Figure LII to the same size as the motor (10) shaft.

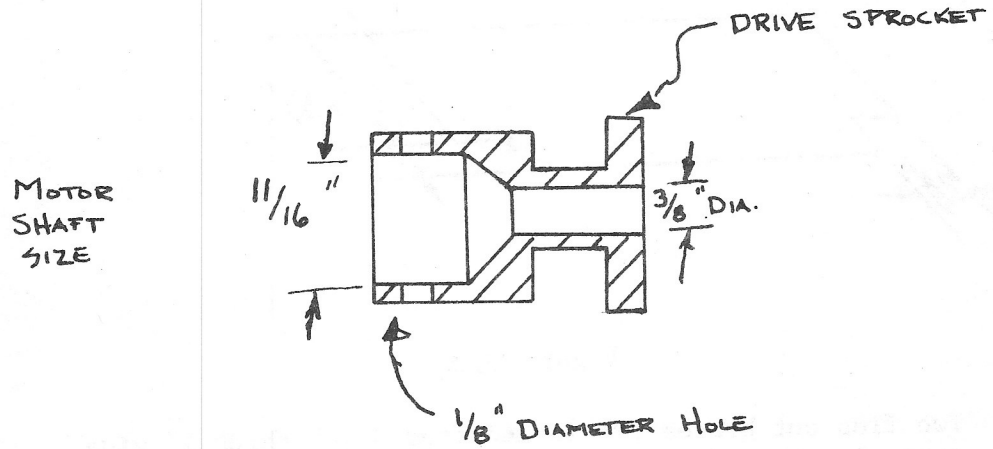


Figure LII

b. Attach the sprocket to the motor shaft with a 3/8" dia. 24 thd bolt.

c. Drill 1/8" dia hole through the base of the sprocket, through the motor shaft and the 3/8" bolt holding the sprocket on the motor shaft. This hole is for a roll pin (11) which will be installed later.

3.11 The Motor Mount

a. Cut a piece from 3/16" thick sheet, 2 1/2" wide and 3 1/4" long.

b. Layout and drill 4 - 9/32" diameter holes as shown in Figure LIII.

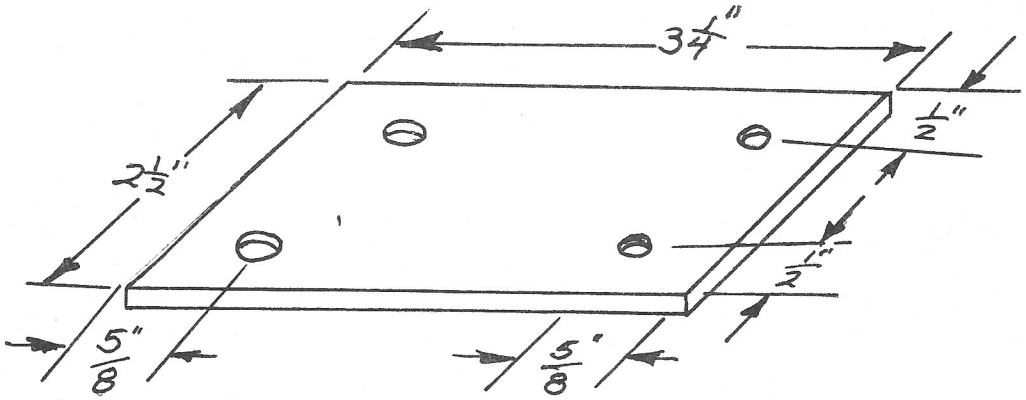


Figure LIII

c. Cut another piece 2 1/2" wide, 3 1/2" long and 3/16" thick.

d. The motor is 3 inches in diameter, so it must be offset to one side a little, so that as the yoke is swung out to lower the platform, the motor will not bump the compression column.

e. Drill the holes as shown in Figure LIV.

3.11 (continued)

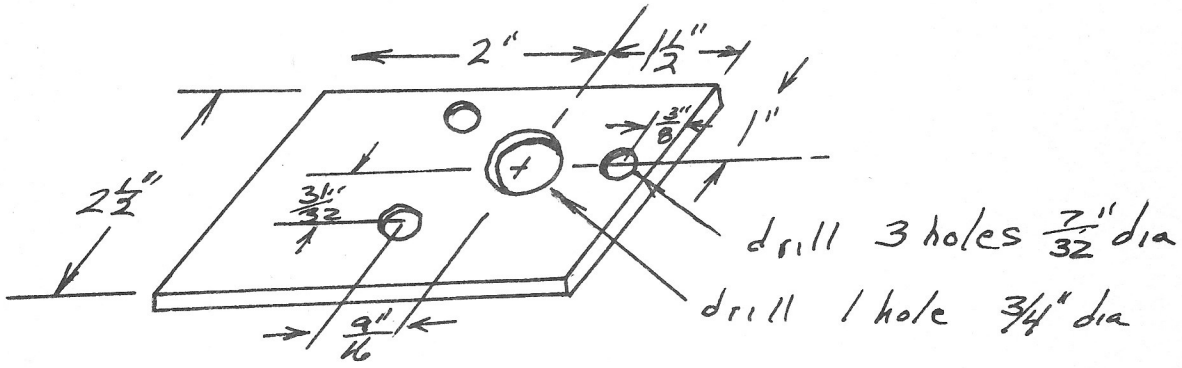


Figure LIV

f. As the motor mount bracket is shown above it is designed for the motor to be mounted on the right side of the yoke. To use it for the left side you just flip it over.

g. Attach the bracket to the motor and mark off the excess material on the short end. Remove the motor and cut off this excess material or at least round the corners to reduce the safety hazard. The bracket should then look as in Figure LV.

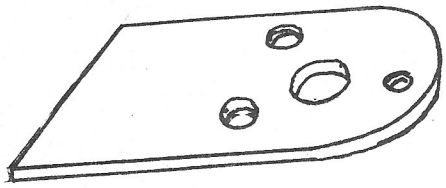


Figure LV

3.11 (continued)

h. The large 3/4" dia hole can be made by laying out the hole and then drilling many small holes on the inside circumference of the circles as shown in Figure LVI.

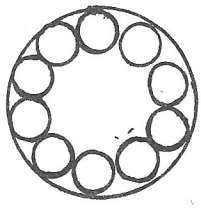


Figure LVI

i. Then a small chisel can be used to cut between the holes and a round file can be used to finish the job.

3.12 The Chain Tightener

a. Cut a piece of 3/16" thick of steel 1" wide, 5" long and drill and slot it as shown in Figure LVII.

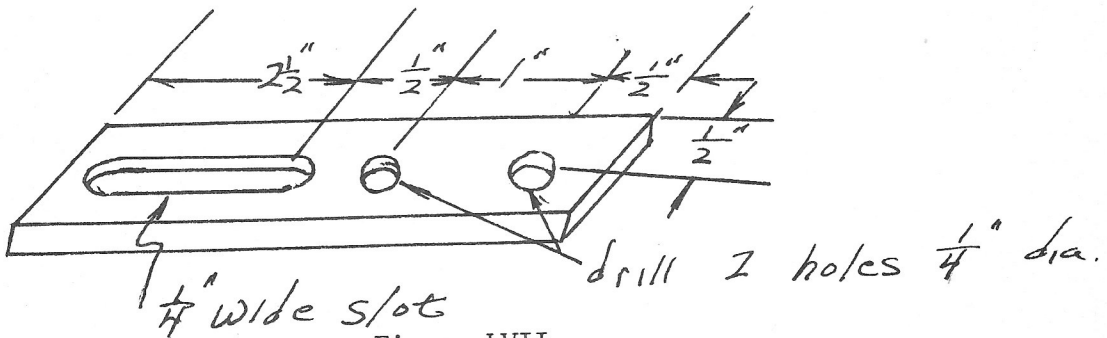


Figure LVII

b. Take two sprockets (9) which are the same as was used for the drive sprocket and drive the oil light bushings (12) into them. This reduces the inside diameter from 3/8" to 1/4".

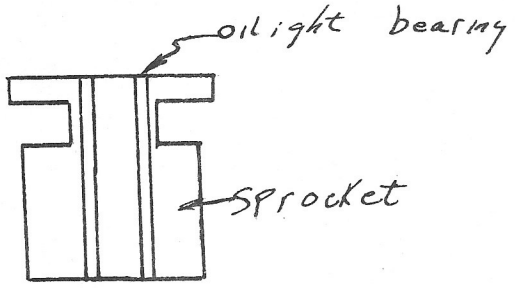


Figure LVIII

c. Set aside for final assembly.

3.13 The Pins

a. The pins are made from 1/2" diameter drill rod (13). Cut two pieces 3" long and two others 3 1/4" long. Deburr the edges.

b. Drill holes in the 3" pins as shown in Figure LIX.

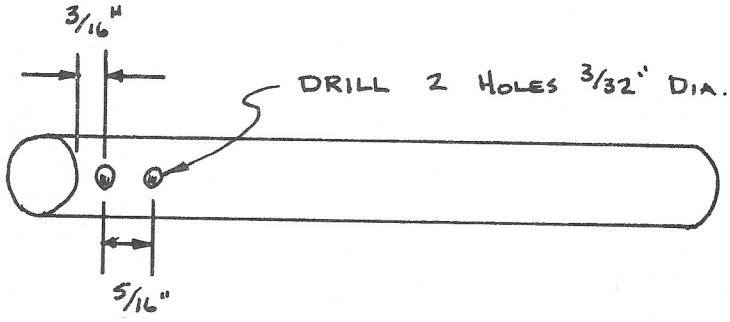


Figure LIX

c. Drill holes in the 3 1/4" pins as shown in Figure LX.

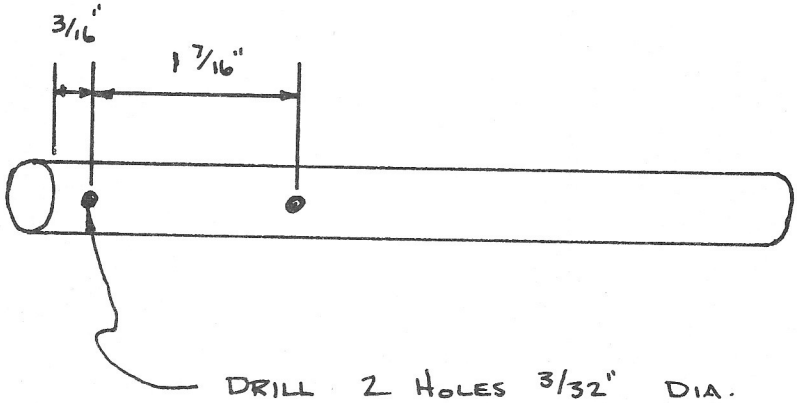


Figure LX

3.14 Construction of the Electrical Control Box

The following pages contain information to construct a control box which is used to energize the motor of the electric lift.

The following figures depict various steps in the assembly procedure.

Figure	Assemble Shown
1.	Physical Layout
2.	Partial Wiring Diagram
3.	Partial Wiring Diagram
4.	Pictorial of Electrical Components
5.	Control Box Wiring
6.	Schematic Diagram

The text contains a step by step procedure to construct a control box. Following the step by step construction procedure, a parts list and approximate cost is included. After the parts list, the central distributors for the American Bosch Company are listed.

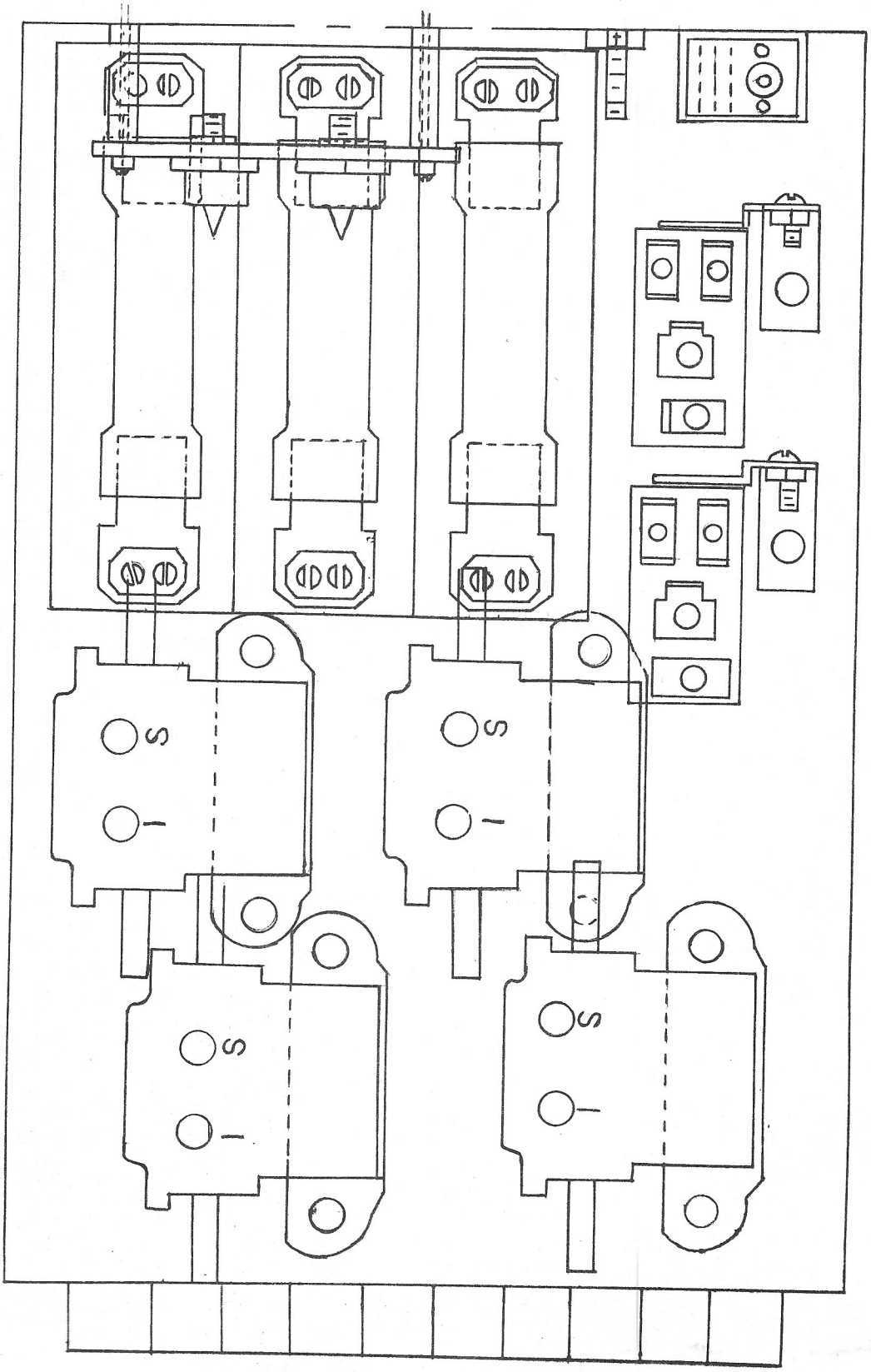


FIGURE 1 PHYSICAL LAYOUT

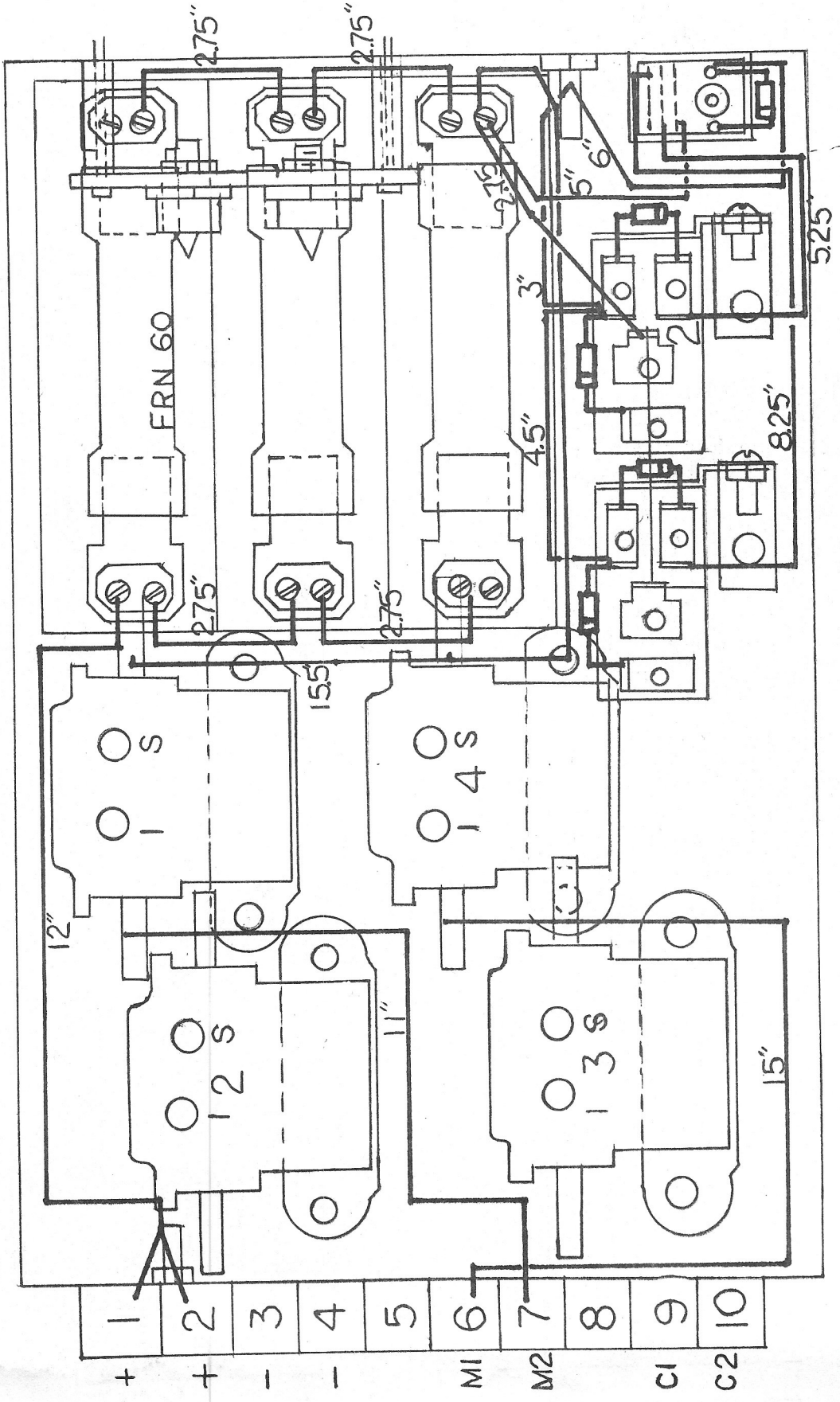


FIGURE 2 WIRING DIAGRAM

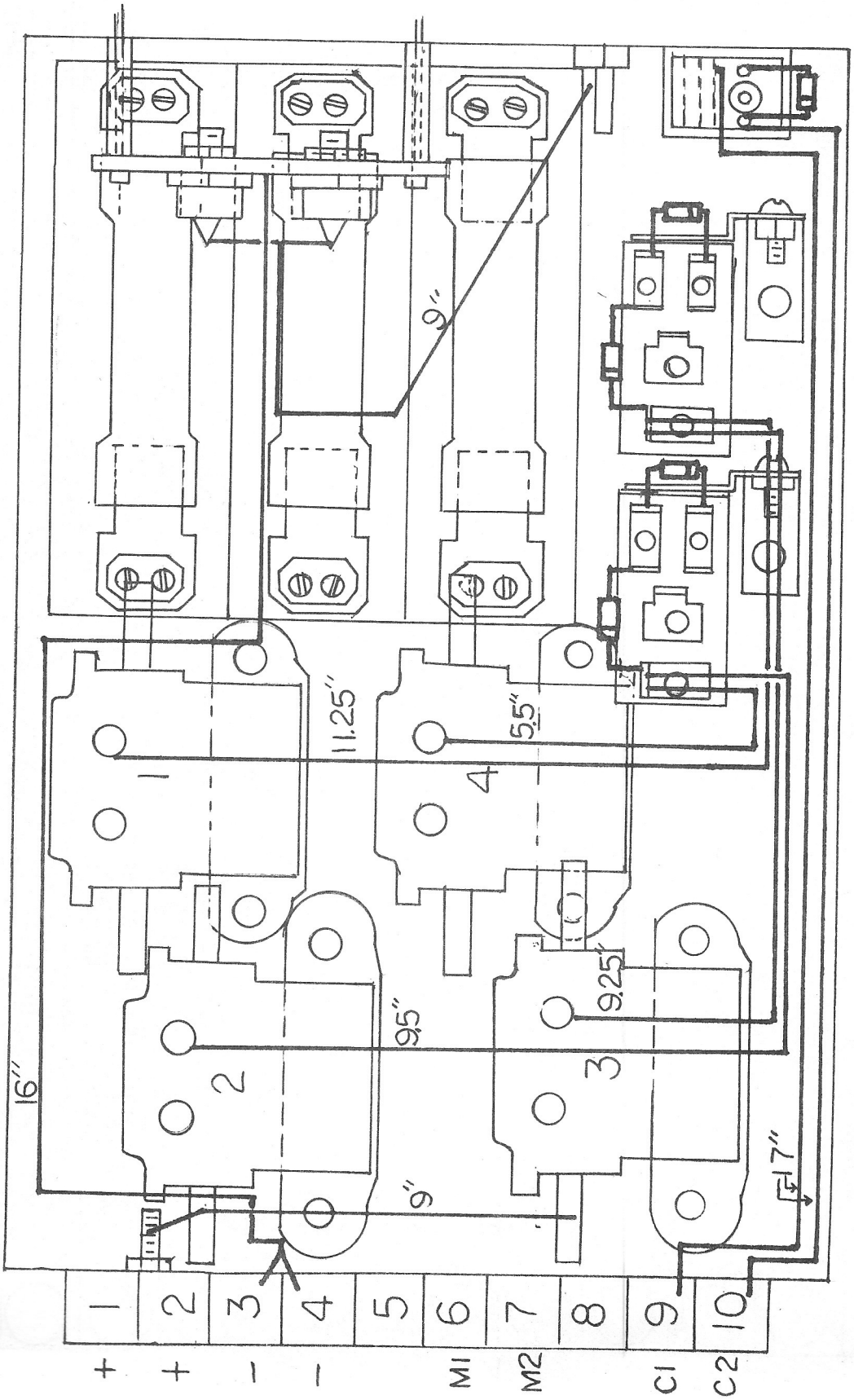
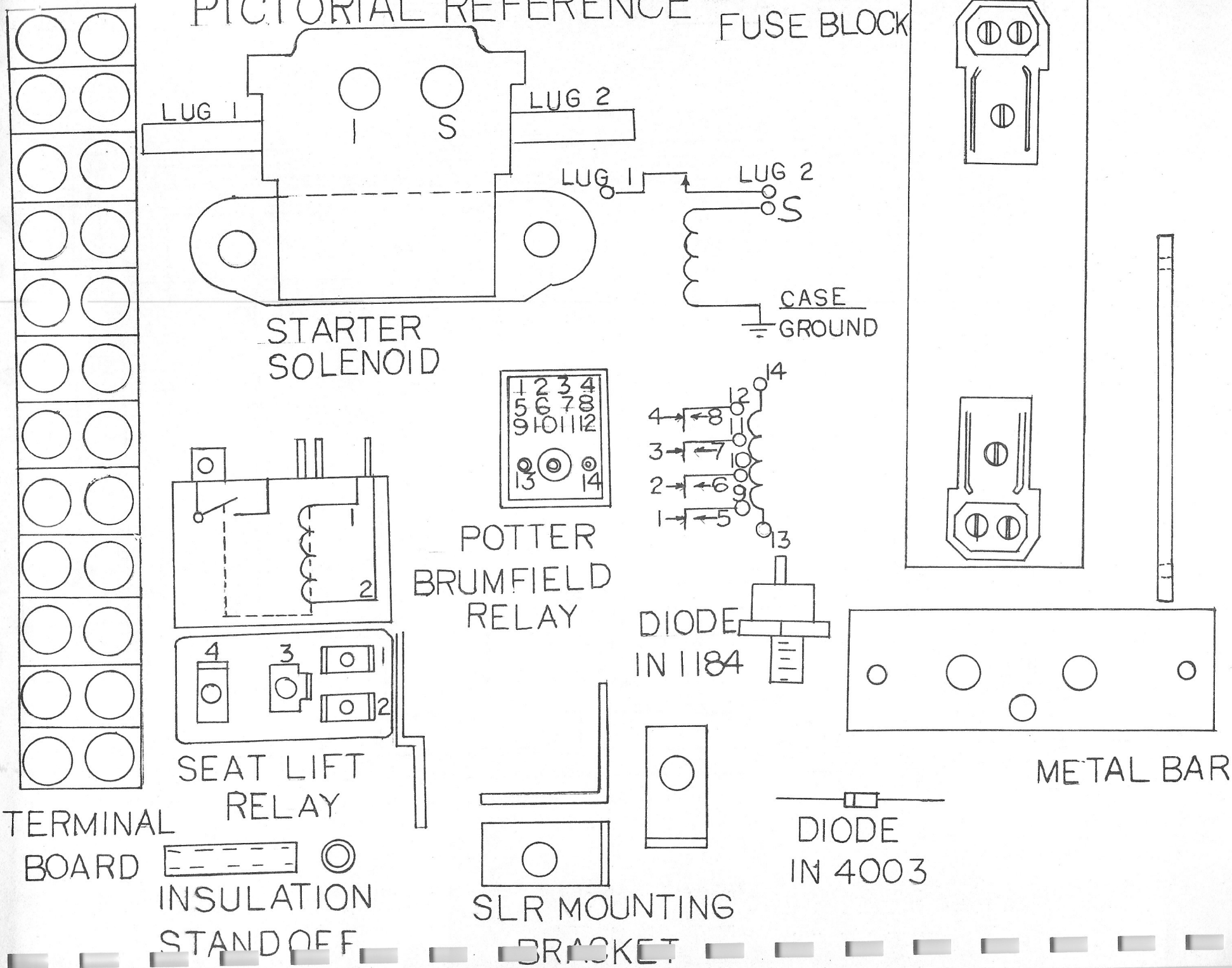


FIGURE 3 WIRING DIAGRAM

PICTORIAL REFERENCE



STEP 1. If metal container does not have a 1" X 6" opening in one end proceed as follows. If container has opening go to Step 2.

A. First draw the rectangle on container end 1/2" from top edge and centered. Refer to DETAIL A.

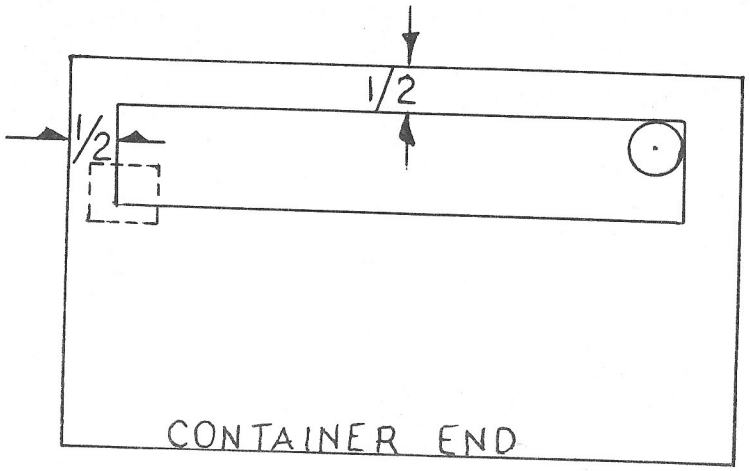
B. Next two holes must be made in order to saw out rectangle. The holes must be as large as hacksaw blade or jigsaw blade. A 7/16" or 1/2" hole saw will usually do the job. If the hole saws are not available a drill can be used, a 1/4" drill will do best. First mark two corners as shown in DETAIL A. Next obtain a center punch (or nail), then make indentations where markings have been made. Placing drill in indentations drill holes. This should allow ample clearance to insert saw blade.

CAUTION: HAVE CONTAINER HELD SECURELY ALSO HOLD DRILL FIRMLY.

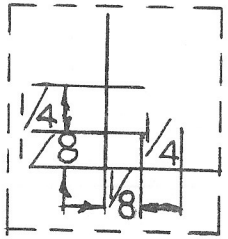
SEVERE JERKING OF THE DRILL MAY RESULT FROM DRILLING HOLES THIS CLOSE.

C. Now cut along the lines drawn.

D. The edges will now be rough from cutting. Use a flat file to smooth these edges.



DETAIL A

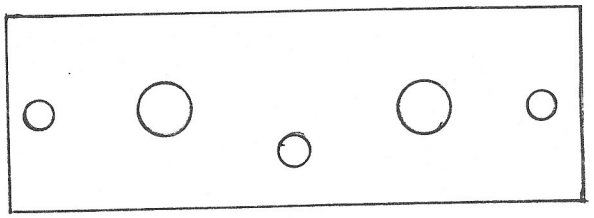


STEP 2. If metal bar has been drilled go to Step 3. If not proceed as follows. Refer to DETAIL B. Mark off holes and use center drill (Or nail) to make indentations for drilling.

A. Drill two 1/8" dia. holes 1/4" from each end and center as shown in DETAIL B.

B. Drill two 1/4" dia. holes 7/8" from each end and center as shown in DETAIL B.

C. Drill one 7/32" dia. hole 1/4" from side and center as shown in DETAIL B.



DETAIL B

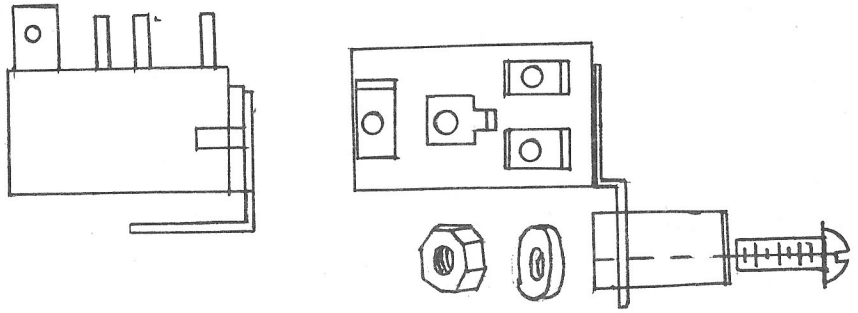
STEP 3. Locate and drill holes for mounting all components.

A. Gather the following parts:

1. Four (4) solenoids.
2. Three (3) fuse blocks.
3. One (1) metal bar.
4. Two (2) seat lift relays and mounting brackets.

a. If fuse blocks are not assembled do so now. NOTE: flange on clips must be on outside of block, so fuses may enter. DO NOT put fuse in at this time.

b. If seat lift relays and mounting brackets are not assembled do so now. Refer to DETAIL C. Hardware needed is two (2) 1/4"-20 round head screws 1/2" long and two (2) 1/4" shakeproofs or lock washers and two (2) nuts.



DETAIL C

B. Referring to FIGURE 1 position the solenoids, fuse blocks, and seat lift relays as shown.
   1. With pencil trace circles in mounting holes (where screws go).
   2. Remove all components from container.
   3. Next make indentations with center punch (or nail).

C. Referring to DETAIL D. Position metal bar over fuse block assembly area about 1/2" from top of container and 3/4" from edge of container. Trace mounting holes. Also mark a spot 1" from top edge and 2 3/8" from side edge as shown in DETAIL D.

D. With center punch make indetentations in all circles.

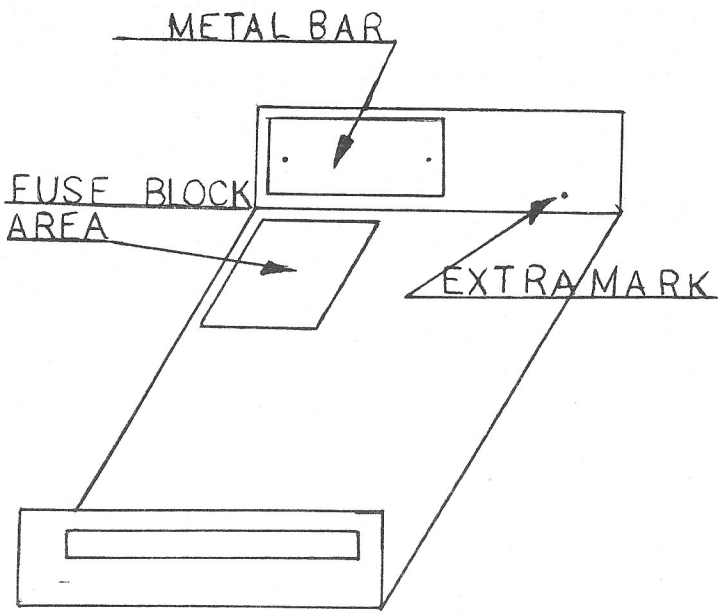
E. Now position terminal board 1" X 6" rectangle on outside of container and trace the four mounting holes. Also mark a hole to be drilled 1" from bottom and 1 1/4" from side as shown in DETAIL E.

F. With center punch make indentations.

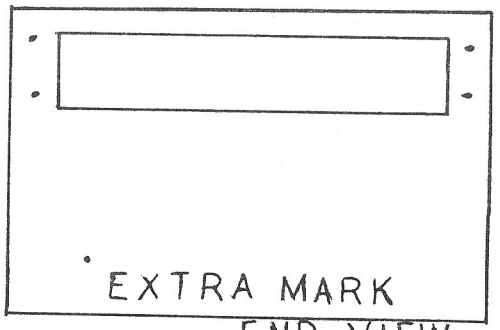
G. Drill all holes with appropriate drill size.

Solenoids-1/4" drill.
Seat lift relays-1/4" drill.
Mark on end of terminal board-1/4" drill.

Fuse blocks-7/32" drill
Terminal board-7/32" drill.
Mark on end with copper bar-7/32" drill
Metal bar mounting holes-1/8" drill



DETAIL D



END VIEW

DETAIL E

STEP 4. Insertion of fuse blocks.

A. Cut four (4) pieces of #8 wire 2 3/4" long and one (1) piece of #8 wire 15 1/2" long. On the 2 3/4" long pieces strip off 3/4" of insulation from each end. On the 15 1/2" long piece strip off 3/4" of insulation from one end.

B. Collect the fuse blocks and refer to FIGURE 2. Insert wires into fuse blocks as shown. The long wire goes in the lower right corner.

C. With 10-32 hardware (six (6) round head screws and six (6) nuts) connect fuse blocks to metal container making sure long wire goes in the lower right hand corner. Refer to DETAIL F. for proper screw and nut placement.

STEP 5. Cement Potter Brumfield to metal container.

A. Using any good quality glue position the Potter Brumfield as shown in FIGURE 1 approsimately 1 3/4" from bottom of metal container.

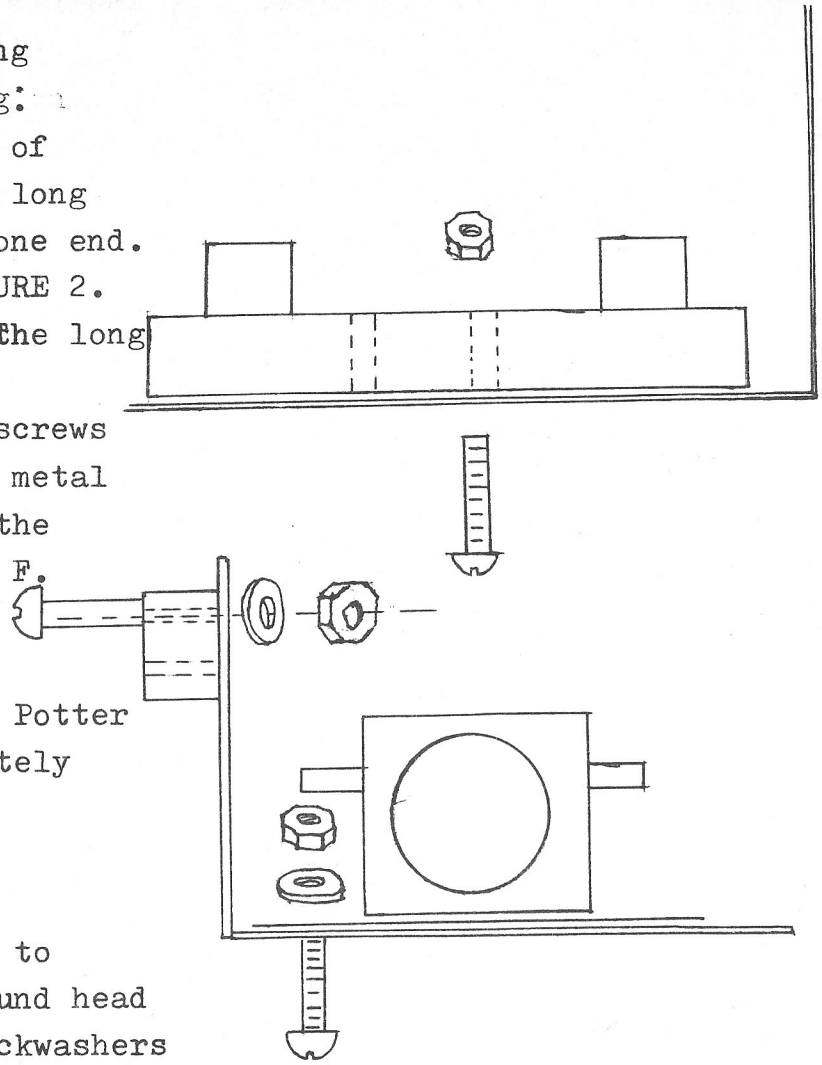
B. Allow ample time to dry.

STEP 6. Insertion of solenoids into metal container.

A. Using 1/4"-20 hardware connect solenoids to metal container. Needed are eight (8) round head screws, eight (8) 1/4" shakeproofs or lockwashers and eight (8) nuts. Refer to DETAIL F for proper positioning of hardware.

STEP 7. Attach terminal board to metal container.

A. Using 10-32 hardware, collect four (4) round head screws, four (4) shakeproofs, and four (4) nuts and position terminal board over rectangle cut in end of container refer to DETAIL F.



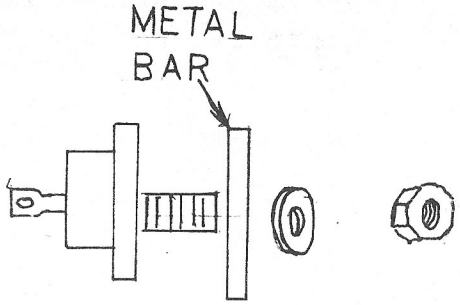
DETAIL F

STEP 8. Final assembly of metal bar.

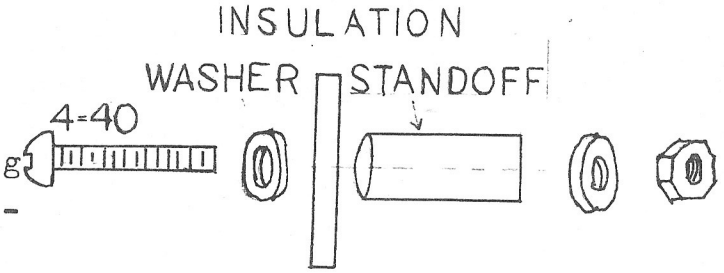
A. Collect two (2) diodes 1N 1184 and mounting hardware, copper bar, and the following hardware,
- 2 - 4-40 round head screws 1 3/8"
- 2 - #4 shakeproofs or lockwashers
- 2 - #4 nuts
- 2 - #4 nylon washers
- 2 - #4 flat washers
- 2 - insulation standoffs 1" long

B. Attach diodes to metal bar as shown in DETAIL G.
NOTE: The position of holes on diodes.
CAUTION: DO NOT over tighten diodes, threads will strip easily.

C. Attach copper bar to metal container by referring to DETAIL H. Making sure that insulators are positioned correctly.



DETAIL G



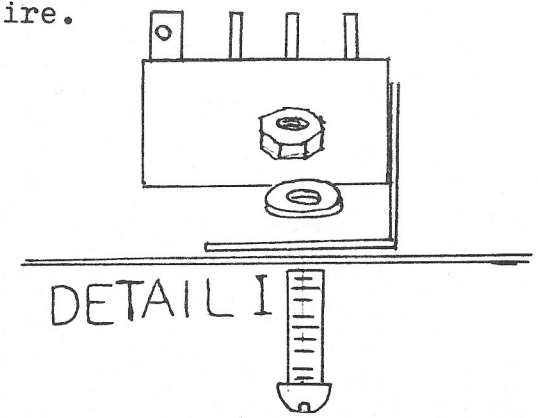
DETAIL H

STEP 9. Attach seat lift relays to metal container.

A First remove 1 1/2" of insulation from end of long wire that on the fuse block. Then measure 5" from the same end and 6" now remove the insulation between 5" and 6" marks.

B. Then bend along the side of the fuse block the wire.

C. Position seat lift relay as shown in FIGURE 1. Refer to DETAIL I for hardware positioning.


DETAIL I

STEP 10. Final wiring of power supply.

A. Cut the following lenghts of number 18 wire.

2 - 17"	1 - 6"	1 - 4 1/2"
1 - 11 1/4"	1 - 5"	1 - 3 1/2"
1 - 9 1/2"	1 - 5 1/4"	1 - 3"
1 - 9 1/4"	1 - 5 1/2"	1 - 2 3/4"
1 - 8 1/4"		

B. Cut the following lenghts of number 8 wire.

1 - 16" 1 - 12" 2 - 9"

1 - 15" 1 - 11"

C. Remove approximately 1/4" insulation from each end of the #18 wire.

D. On the following pieces of #8 wire strip off 1/2" from one end and place a #8 lug on each. 16" piece and one 9" piece.

E. Insert fuses FRN 60 amps. into clips at this time.

F. Wiring of solenoids.

1. Take the 9" piece of #8 wire that does not have the lug on it and strip off 1 1/2" of insulation from one end. Then measure in from the same end 2" and again 3 1/2" and remove the insulation between the 2" and 3 1/2" marks.
2. Next find the 1/4"-20 round head screw 3/4" long and two (2) 1/4" nuts and one 1/4" shakeproof. Putting the screw in from the outside put on one nut and tighten firmly. Now taking the that has the two bare spots hook the end around the screw and place a shakeproof on the screw then tighten with another nut.
3. Bending the remaining bare spot into the shape of a horseshoe hook this part over solenoid 2 lug 1 and tighten the nut. Refer to pictorial for lug numbers.
4. Hooking the remaining end over solenoid 3 lug 1 tighten nut firmly.
5. Next take the long wire that is attached to fuse block and bend the stripped area into the shape of a horseshoe attach this to solenoid 1 lug 2 and tighten the nut.
6. Taking the 12" piece of #8 wire strip off from one end 3/4" insulation and 1 1/4" from the other end. Placing the end that had 3/4" insulation removed into the fuse block in the upper left corner tighten firmly. Refer to FIGURE 2 for location. Take the other end and divide the strands equally. Place one group into terminal 1 of terminal board and the other group into terminal 2. It may be necessary to remove the screws in terminal 1, 2, 3,4,6,7,9,10.

After inserting wires into terminals solder wires to terminals.

7. Using the 16" long #8 wire with the lug on it fasten the lug to the copper bar with 10-32 hardware. Bending of the lug will make fastening easier. Take the other end and divide into two groups as in previous step. THen insert into terminals 3 and 4 and solder. Refer to FIGURE 3.
8. Find the 15" long piece of #8 wire and strip off 3" of insulation from one end and 3/4" from the other end. Taking the end that had 3" of insulation removed, hook the <u>end</u> around solenoid 4 lug 1 and tighten nut. Next run the remaining bare wire to solenoid 3 lug 2 and tighten nut. Clipping 2 or 3 strands of copper wire on one end insert this end into terminal 6 of terminal board and solder.
9. Take the 11" piece of #8 wire and do the same as in previous step. This wire will be hooked to solenoid 1 lug 2 and solenoid 2 lug 2. The remaining end is inserted into terminal 7 of terminal board and soldered.
10. With the 9" piece of #8 wire the lug, strip 3/4" of insulation from the other end and divide the strands equally. One group will be inserted into one of the holes in the diode 1N 1184 that is mounted on the copper bar and the other group into the other diode. After inserting the wire into the diodes solder them. With the other end of the 9" wire attach to container wall. Find a 10-32 round head screw 3/4" long, and two (2) #10 nuts and one shakeproof. Insert screw into container from outside and place the lug on the screw and tighten down with shakeproof and nut.

G. Insertion of diodes 1N 4003.

1. Refer to FIGURE 3 and pictorial for proper location. <u>Note</u> the color band on these diodes it is important that they are positioned as as shown in FIGURE 3.
2. On each seat lift relay between terminals 1 and 2 goes one diode.

Make sure band on diode is positioned correctly. NOTE Heat will sometimes destroy diodes if it is too excessive. It is advised to use a heat sink to absorb the heat. A pair of pointed nose pliers will do. Clamp the pliers next to the diodes and solder the diodes to the terminals 1 and 2. Do Not Attempt to solder the diodes between terminals 1 and 4.

3. Taking one end of the 5 1/2" and 9 1/2" #18 wire and the marked end of a diode 1N 4003 and insert them through the hole in terminal 4 of seat relay 2 and solder. After soldering, place a lug on the other end of each wire. Running the 9 1/2" wire to solenoid 2 attach lug to terminal S. Run the 5 1/2" wire to solenoid 4 terminal S and attach.
4. Take one end of the 11 1/4" and 9 1/4" wire and the marked end of a diode 1N 4003 and insert through the #4 terminal of seat lift relay 2 and solder. After soldering place a lug on each wire. Then run the 11 1/4" wire to solenoid 1 terminal S and attach. Run the 9 1/4" wire to solenoid 3 terminal S and attach.
5. Taking one end of the 4 1/2" and 3" wire and the other end of the diode that was soldered to terminal 4 of seat lift relay 2 and insert through hole in terminal 1 of seat lift relay 2 and solder.
6. Take the end of the 4 1/2" wire just soldered to terminal 1 of seat lift relay 2 and insert into terminal 1 of seat lift relay 1 also insert the other end of the diode soldered to terminal 4 of seat lift relay 1 and solder.
7. On the other end of the 3" wire in section 5 place a #18 lug.
8. Looking to the Potter Brumfield insert the banded end of diode 1N 4003 into terminal 13, also insert one end of a 17" long #18 wire and solder.

H. Final wiring of Potter Brumfield.

1. Taking the other 17" long #18 wire insert one through terminal 12 and solder.
2. Using the 5" long #18 wire insert through terminal 9 and solder, also

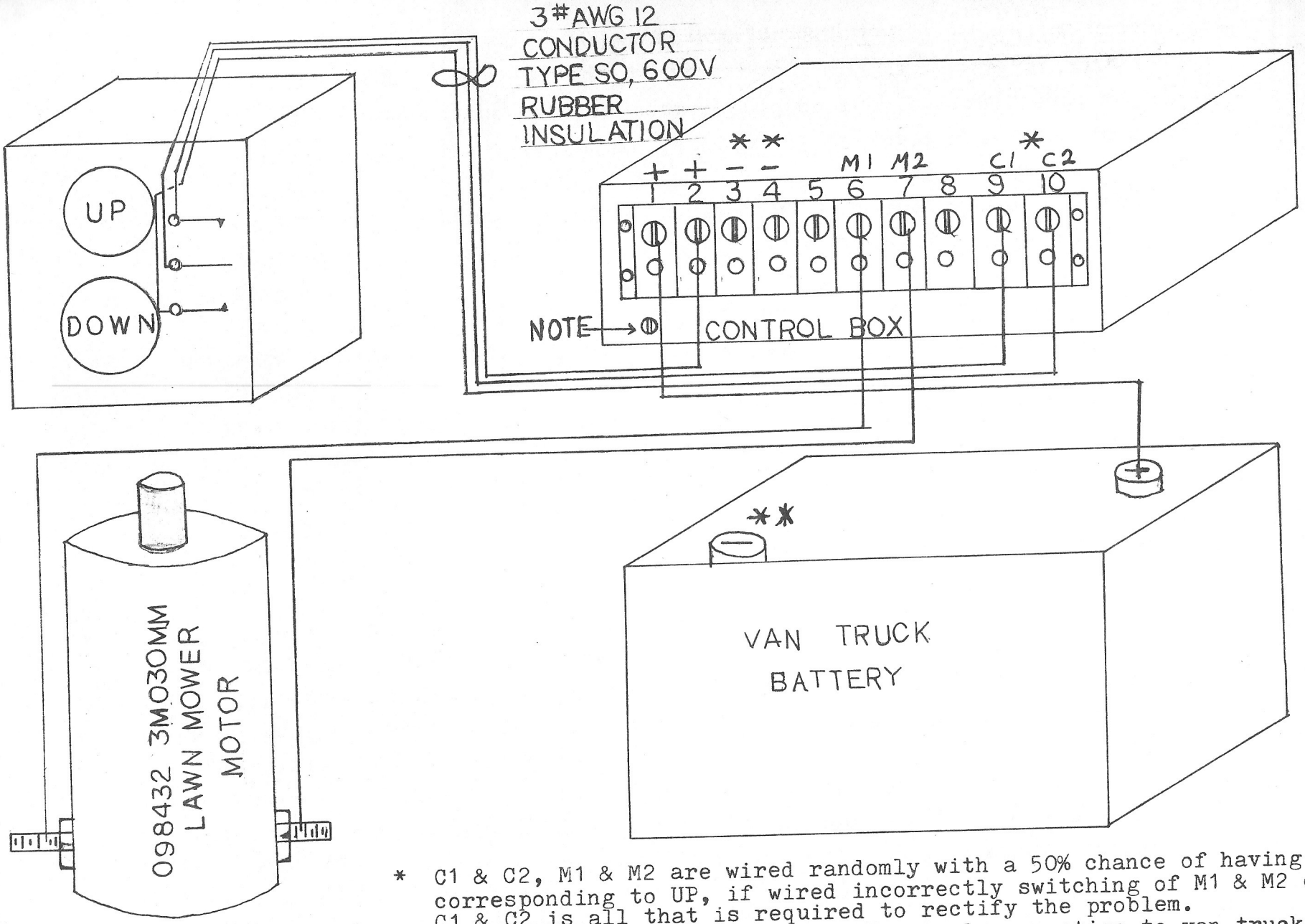
on the other end of the wire place a lug.

3. Taking the 5 1/4" long #18 wire insert one end through terminal 5 and solder.
4. Using the 8 1/4" long #18 wire insert one end through terminal 4 and solder.

I. Final wiring of #18 wire.

1. Take one end of the 3 1/2" long #18 wire and insert through terminal 3 of seat lift relay 1 and solder, Insert the other end along with one end of the 2 3/4" long piece of #18 wire into terminal 3 of seat lift relay 2 and solder.
2. With the other end of the 2 3/4" wire place a lug.
3. Referring to FIGURE 2, unscrew the screw where the 2 3/4" and 5" wire are both located on the fuse block. Insert the screw through the lugs of the 2 3/4" and 5" wire and replace screw and tighten.
4. Take the 3" long wire soldered to terminal 1 of seat lift relay 2 and the 6" long wire attached to terminal 14 of the Potter Brumfield and place the lugs onto the screw used in section 10 of part G. and tighten with another nut.
5. Taking the 5 1/4" wire attached to terminal 5 of the Potter Brumfield and insert it through the hole in terminal 2 of seat lift relay 2 and solder.
6. Taking the 8 1/4" wire attached to terminal 1 of the Potter Brumfield and insert it through the hole in terminal 1 of seat lift relay 1 and solder.
7. Taking the 17" wire attached to terminal 12 of the Potter Brumfield and insert it through the hole in terminal 9 of the terminal board and solder.
8. Taking the 17" wire attached to terminal 13 of the Potter Brumfield and insert it through the hole in terminal 10 of the terminal board and solder.
9. Refer to FIGURE 3 and tie the wires together with nylon tie straps or cord.

YOU HAVE NOW FINISHED!!!



* C1 & C2, M1 & M2 are wired randomly with a 50% chance of having UP corresponding to UP, if wired incorrectly switching of M1 & M2 or C1 & C2 is all that is required to rectify the problem.

** GROUND connection is made by <u>mechanical</u> connection to van truck chassis - no wire required.

PARTS LIST CONT.

1 - 10 terminal, terminal board
Jones terminal strip 10-140-314W $1.50

3 - fuse blocks and clip set
1068 Chase Shawmut $2.55 EA

2 - diodes 1N 1184 $2.10 EA

1 - Potter Brumfield relay
226 KHP 4PDT 3 A. 12 VDC $4.65

5 - diodes 1N 4003 $.37 EA

4 - nylon tie straps $

1 - Budd Box
CU-2111A $5.35

These parts may be purchased any Grahams electronics.

---

1 - motor #0984323 M030 MM
American Bosch Electrical Products. $66.95

This motor may be purchased at Mac Allister Machinery
7515 E. 30th St.

PARTS LIST

12 - 1/4"-20 round head screw 1/2" long
1 - 1/4"-20 round head screw 3/4" long
14 - 1/4" nuts
13 - 1/4" shakeproofs or lockwashers
8 - 5/16" flat washers or lockwashers
12 - 10-32 round head screws 3/4" long
13 - 10-32 nuts
12 - #10 shakeproofs or lockwashers
2 - 4-40 round head screws 1 3/8" long
2 - #4 flat washers
2 - #4 shakeproofs or lockwashers
1 - copper bar 1" X 3" X 1/8"

These parts may be purchased at any hardware store. The cost will probably vary by the quantity purchased.

---

4 - soleniods switches
Sorensen SS-9 Used in Ford autos $ 6.95

2 - seat lift relays
Delco #5717528 Used in larger autos $ 3.94 EA

These can be purchased at most auto parts stores.

---

1 - push button control
Allen Bradley 800-2SC $ _____

1 - cord grip for P-B control box $ .50

* 10 ft. - 3 conductor 12 wire $ _____

30 ft. - #18 wire $$ _____

10 ft. - #8 wire $ _____

10 - #18 lugs $ _____

2 - #8 lugs $ _____

3 - fuses FRN 60 amps $ .60

These parts may be purchased at Farrel Argast Electric Co.

* LENGHT DEPENDS UPON CONTROL BOX POSITION WITH RESPECT TO LIFT

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H. G. Makelim Co.
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S. San Francisco, California 94080

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226 N. Marine
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Central Motive Power Inc.
6301 N. Broadway
Denver, Colorado 80216

Connell Auto Inc.
940 River St.
Windsor, Connecticut 06095

Florida Diesel & Elec. Co.
2717 N. W. 34 th. st.
Miami, Florida 33142

Interstate Diesel Serv. Inc.
4220 N. Orange Blossom Trail
Orlando, Florida 32804

Diesel Inj. of Georgia, Inc.
4767 Clark Howell Hwy.
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Schultz Automotive
941 Kawaiahao St.
Honolulu, Hawaii 96814

Illinois Auto Elec. Co.
656 County Line Rd.
Elmhurst, Illinois 60126

The Cowie Elec Co. Inc.
230 S. Topeka Ave.
Wichita, Kanas 67202

Diesel Injection Serv. Co.
4710 Allmond Ave.
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1050 Carondelet St.
New Orleans, Louisana 70130

Magneto Ignition Serv. Co. Inc.
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Shreveport, Louisiana 71107

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1200 66th. St.
Baltimore, Maryland 21237

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60 Providence Hwy-Rte 1
Halpole, Massachusettes 02032

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15550 Woodrow Wilson Ave.
Detroit, Michigan 48238

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1253 Eagan Industrail Rd.
St. Paul,Minnesota 55118

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Kansas City, Missouri 64108

Elec. Parts & Serv. Co.
140 Progress Pkwy.
Maryland Hts., Missouri 63043

Original Equip. Inc.
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Billings, Montana 59101

R.P.W., Inc. Ind. Div.
7402 'L' St.
Omaha, Nebraska 68103

Automotive Equip. Co.
Div. of Tire Trading Co.
123 Hudson St.
Newark, New Jersey 07103

Hettrich Elec. Serv. Inc.
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Buffalo, New York 14214

Enrlich Elec. Serv. Inc.
200 4th St.
Troy, New York 12181

Broadway Ignition Co. Inc.
47-47 58th St.
Woodside, New York 11377

Auto Elec. Associates, Inc.
700 W. 28th St.
Charlotte, North Carolina 28201

The Cleveland Ingition Co.
10646 Lever Ave.
Cleveland, Ohio 44108

American Elec. Ignition Co.
124 N.W. 8th St.
Oklahoma City, Oklahoma 73101

Magneto Ignition Co. Inc.
7450 E. 46th Place
Tulsa, Oklahoma 74145

Automotive Products Inc.
1700 S.E. Grand Ave.
Portland, Oregon 97214

Sullivan Bros.
445 N. 63rd St.
Philadelphia, Pennsylvania 19151

Auto Ignition Co. Inc.
301 Meade St. at Trenton Ave.
Pittsburgh, Pennslyvania 15221

Automotive Elec. Corp.
3250 Millbranch Rd.
Memphis, Tennenne 38116

Grayson Co.
666 S. Central Ave.
Dallas, Texas 75221

Spitzer Auto & Indust. Products Co.
1055 Hawkins Blvd.
El Paso, Texas 79926

Wahlberg-Mccreary, Inc.
3810 Dacoma Rd.
Houston, Texas 77018

S. X. Callahan
824 S. Laredo St.
San Antonio, Texas 78207

Diesel Elec. Serv. & Supply
652 W. 17th St.
Salt Lake City, Utah 84104

Truck Indust. Marine Pts. Whse. Inc.
716 May Ave
Norfolk, Virginia 23516

Bitco Western Inc.
1741 1st Ave. S.
Seattle, Washington 98134

Auto Jobbers Supply Co.
S. 125 Walnut St.
Spokane, Washington 99210

MacFadden Igntion Co.
108 Broad St.
Charleston, West Virginia 25322

Fuel Inj. & Elec. Inc.
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Milwaukee, Wisconsin 53212

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Suntester Equip.'Cntrl' Ltd.
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Cadel Ltd.
1220 Montee de Liesse
Montreal 384
Quebec, Canada

Elec. Motor Serv. Ltd.
1234 Scarth St.
Regina
Saskatchewan, Canada

4.0 Lift Installation

4.1 Installation of the Compression Members

a. Refer back to 3.1.g. Stand the left column up in place. Be sure that the boss on the top end is on the inside of the opening and also toward the rear of the van. Position the column so that it is parallel to the side of the opening with the bottom of the column in desired position. With a pencil mark the roof beam on each side of the compression member. Observe where the center of the boss hole is relative to the bottom of the roof beam. It should be at the same level as the bottom of the roof beam. Repeat with the right compression member on the opposite side. Determine which one has the center of the boss hole highest in relation to the bottom of the roof beam. That one should be installed first.

b. Hold the compression member in place and determine where a hole should be placed to hold the top end of the compression member to the roof beam. Mark and drill the hole a 3/8" diameter bolt. The next step is to fasten the upper end of the compression column to the roof beam with a bolt and nut. This can be difficult. In some vans the rear section of the head liner must be removed first. Some roof beams are open on top so that the nut can be held, but in others this is not true. In the latter case another hole which is about one half of an inch to the side of the 3/8" dia. hole. This allows one to tape the nut to his fore finger and get the nut started on the bolt. Once the lift is installed the holes are plugged with 1" dia. hole plugs found at electrical supply houses.

c. Again, being sure the compression member is in its proper position, prepare to locate and drill the holes in the floor. If the columns are to be set on the top of a rubber mat, no problem. But if the columns are to be set on carpet extra care must be taken to prevent unraveling the carpet. Mark the hole and cut the carpet away or burn a hole with a large soldering iron etc.. The hot iron works well because it fuses the fibers together so that the drill will not snag and unravel the carpet. Drill the holes 3/8" dia., and bolt the column down.

d. Place the opposite column into position. Temporarily put the yoke assembly into position with the supporting pins, to check alignment. Shim up the last column until the yoke swings free. Mark and drill the top of the column to attach to the roof beam and attach. Locate and drill the holes in the floor. Again use the yoke assembly to check for freedom of swing and alignment. Some shimming might be necessary when the bolts through the floor are tightened. When all the bolts are tightened and alignment is ok remove the yoke assembly.

4.2 Final Assembly of the Yoke

a. Stand up the internal lift column with the nuts up right. Oil the nuts with #10 wt oil and then thread the screw assemblies into the nuts. Smear molyb denum disulfide lithium grease on the screw and screw it into the nut for about a half a foot. Fill the recess in the top of the internal lift column with grease and then smear grease on the outside of the lift column. It will be a mess.

b. Lay the yoke assembly down with the boss toward the upper surface. While one person slides the external lift column into the yoke another person with a flash light and a screw driver glides the upper portion of the screw assembly through the bearing on the top of the yoke. Be sure that the foot pad on the internal lift column is in the proper position. The foot pad should be toward the inside and upper surfaces of the yoke. Once the screw assembly is in the bearing, slide on the thrust bearing (3), the sprocket (4) drilled out to 5/8" ID. and then screw on the 1/2" dia. nut. With a speed wrench tighten the nut and pull the internal lift column into the yoke assembly.

c. Drill and pin the nuts as shown in Figure LX. Tighten the set screw in the sprocket and lubricate the bearing assembly and the thrust bearing with #10 wt oil.

4.2 (continued)

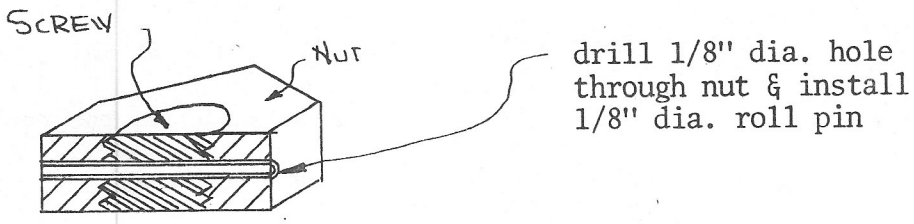


Figure LX

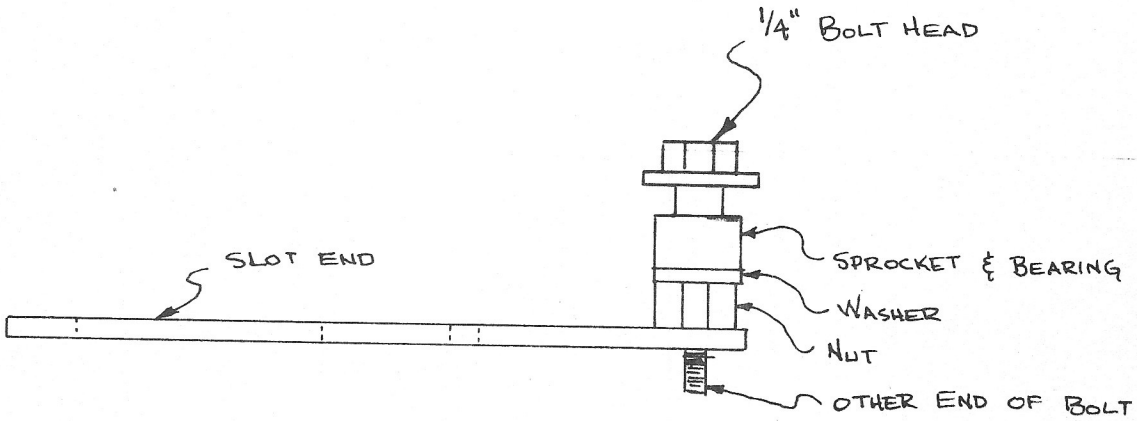
d. Take the part of the motor mount completed in 3.11, b and and attach it to the yoke using 1/4" dia. 20 thd. bolts and lock washers - note that the bolts that go into the bottom two topped holes must not be too long or they will interfere with the internal lift columns at the top of their travel.

e. Attach the motor to the bracket completed in 3.11,g with the motor wire lead side of the motor so that it will face toward the front of the van.

f. Attach the drive sprocket to the motor shaft finger tight. Hold the motor in position against the part of the motor mount attached to the yoke. Move the motor up and down until the drive sprocket is properly aligned with the sprocket on the screw. Mark a line on the piece already attached to the yoke. Remove the piece from the yoke and the motor from it's bracket. Weld the bracket to the piece that was bolted to the yoke. If the bracket falls on the upper holes of the part attached to the yoke, new holes will have to be made.

g. Reattach the motor mount to the yoke, mount the motor and the sprocket. Only, this time take care that the 1/8" diameter hole in the sprocket lines up with the same hole in the motor shaft and the 5/16" bolt. When all are lined up insert a 1/8" decimeter roll pin. It might help to insert the roll pin into one side of the sprocket and into one side of the motor shaft a little first. Then put the bolt into place. Tighten the bolt and check with a flash light from the other side to see when the bolt is lined up with the hole. When it is, finish driving the pin through.

h. Assemble the chain tightener as shown in Figure LXI.



i. Attach it to the top of the yoke in the center as shown in Figure LXII.

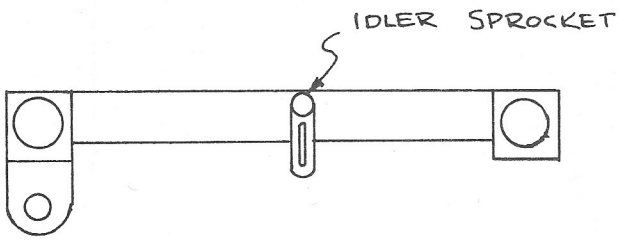


Figure LXII

j. Locate and drill a 1/4" diameter hole so that the idler sprocket toward the rear of the van does not over lap as shown in Figure LXIII.

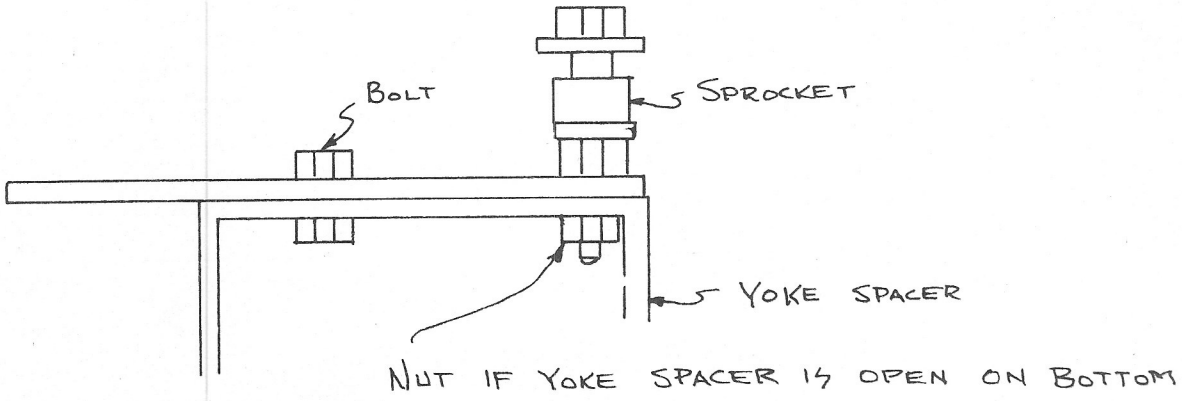


Figure LXIII

4.2 (continued)

j. (Continued)

Drill and put in the other bolt. If the yoke is open on the bottom you can drill 1/4" diameter holes and use lock washers and nuts to hold the tightener in place. If the bottom of the yoke spacer is not open then you must drill a #8 teep drill and top them with a 1/4" diameter 20 thd tap.

k. Next install the chain. Start out long and besure you have at least two master links. Wrap the chain around the sprocket and inside the idler on the yoke spacer. Determine the proper length for the chain. Cut the chain. If you are short add the necessary links so that you can at last close the loop. The chain will probably appear to be too loose but the rest of the chain tightener will take care of it. Besure at this time that both internal lift columns are evenly retracted at this time.

l. We are ready to install the rest of the chain tightener. It not only tightens the chain but also supports the chain and in doing so reduces chain whip and noise. Place the other idler assembly into position in the slot and on the outside of the chain. Move the idler in to tighten and support the chain. If the idlers are too low use washers to raise them up. If they are too high they may be turned over and again washered up to the correct height.

4.3 Installation of the Yoke & Internal Lift Column Assembly

a. Retract the internal lift columns to the maximum limit.

b. Place the yoke assembly in the rear of the van with the top of the yoke toward the front of the van with the motor side down.

c. Slide the yoke forward until the foot pads are in between the compression columns and then, pivot the top of the yoke upward into position leaving the foot pads on the floor of the van.

d. Put a racket wrench on one of the nuts on the screw assembly and raise the yoke assembly until the second set of pin holes on one side or the other lines up. Insert the pin. Now

4.3 (d) (continued)

lower the yoke assembly until the opposite set of pin holes lines up, and insert the pin.

e. Safety the pins. As shown in Figure LXIV.

f. Connect the electrical power to the motor.

4.4 Flop Out Installation

a. With the internal lift columns completely retracted, the yoke should swing freely. Lay the flop out ahead of the yoke assembly so braces will engage the yoke. Push the hole works toward the rear of the van. While doing so sight along the front side of the yoke column. When the front side of the column clears the bumper the flop out is in proper position. Center the flop out from side to side. Drill and use self tapping sheet metal screws to hold the flop out hinge to the floor. Again be careful to not unravel carpet. An easy way to prevent carpet unraveling is to heat a large nail in some vice grips with a propane torch and burn holes through the carpet. You can then drill through these holes without fear of the carpet fibers catching in the drill bit.

4.5 Platform Installation

a. Swing out the yoke, drop the flopout and run the internal lift columns down almost to the ground. Slip the platform into position between the internal lift columns. With one person holding the outer end of the platform, another person can adjust and drive the pins in from the outside of the lift columns. Safety the pins on the inside of the platform beams, and the internal lift columns as shown in Figure LXV.

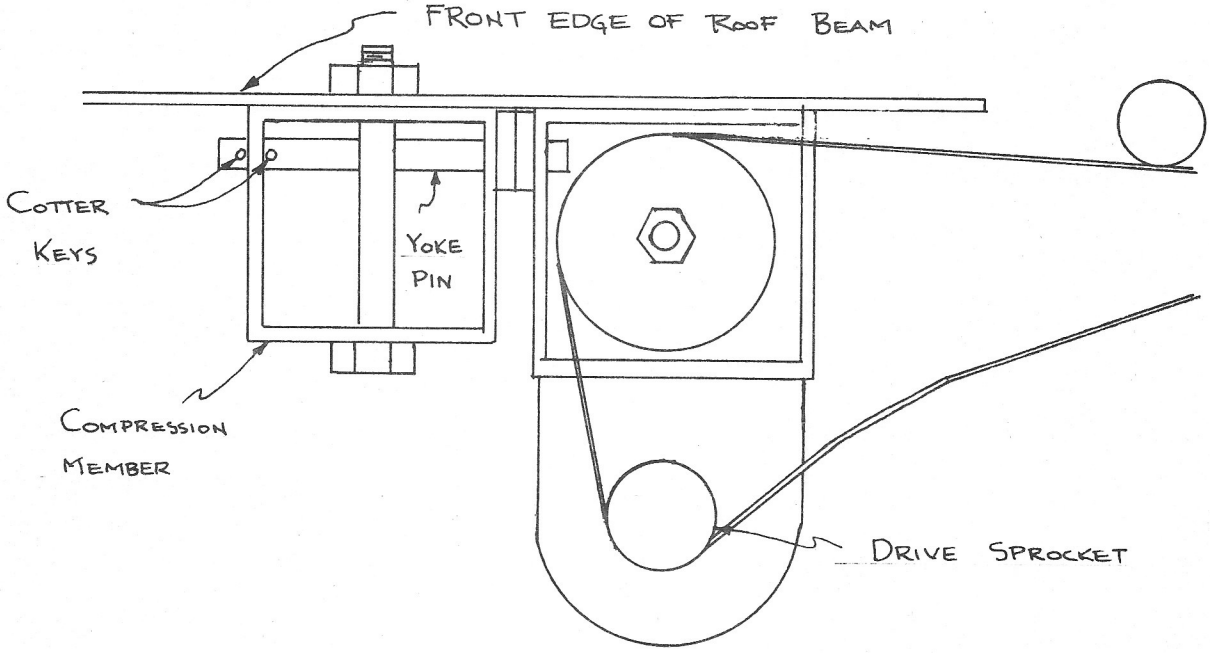


Figure LXIV

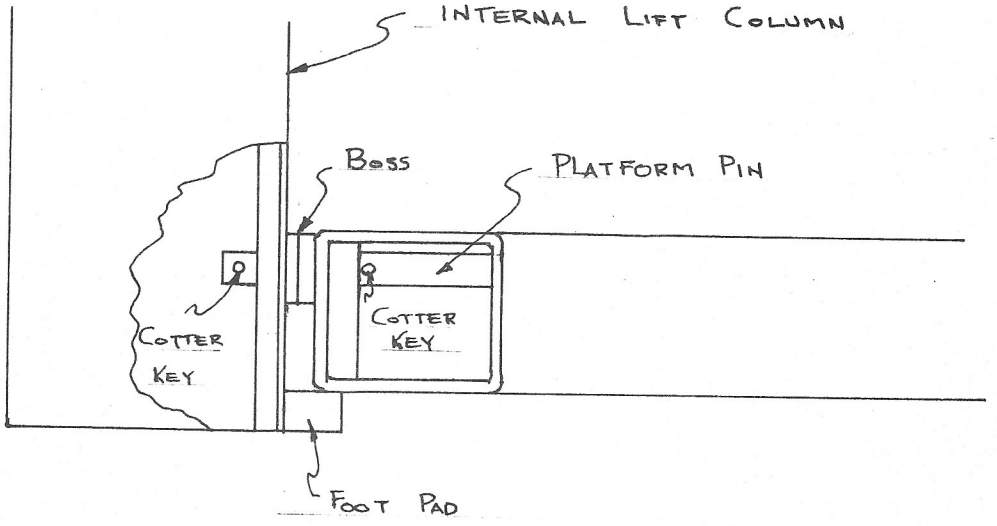


Figure LXV

4.5 (a) (continued)

Retract the internal lift columns and lift to fold the platform. If the platform does not fold properly due to improper alignment, the sprocket chain will have to be removed and one of the sprockets revolved until the platform folds properly. Then replace the chain and the installation is complete.

5.0 Maintenance

a. Lubrication-, once or twice a year, re oil the bearing assembly, the idlers and the thrust bearings. Also extend or lower the platform. Wipe all grease off of the internal lift columns and smear on some new grease. Wipe the chain down with an oily rag.

b. Check all pins to see if they are still safetied. Look around at the welded joints for cracks. Also periodically check the chain tension.

6.0 Operating Suggestions

a. There are no safety devices placed in the control circuit to this lift to prevent the operator from raising the platform too high or lowering it into the ground. This was not done because of design constraints. Therefore, the operator must take care to stop early and to jog the control buttons to stop the platform at floor or ground level. If a person raises the platform too high and continues to hold the control button in for more upward travel, a fuse in the control box will blow to protect the motor from burning out. The same will happen if the lift is attempted to be used for a jack to lift the van to fix a flat on the rear.

b. If a fuse should blow for some reason or the electrical system fails the lift can still be operated. This is accomplished by placing a ratchet wrench on one of the screw nuts and manually rotating the screws. It is time absorbing, but you will not be trapped in or out of the van.

c. Be careful of lowering the platform to a down hill slope as shown in Figure LXVI.

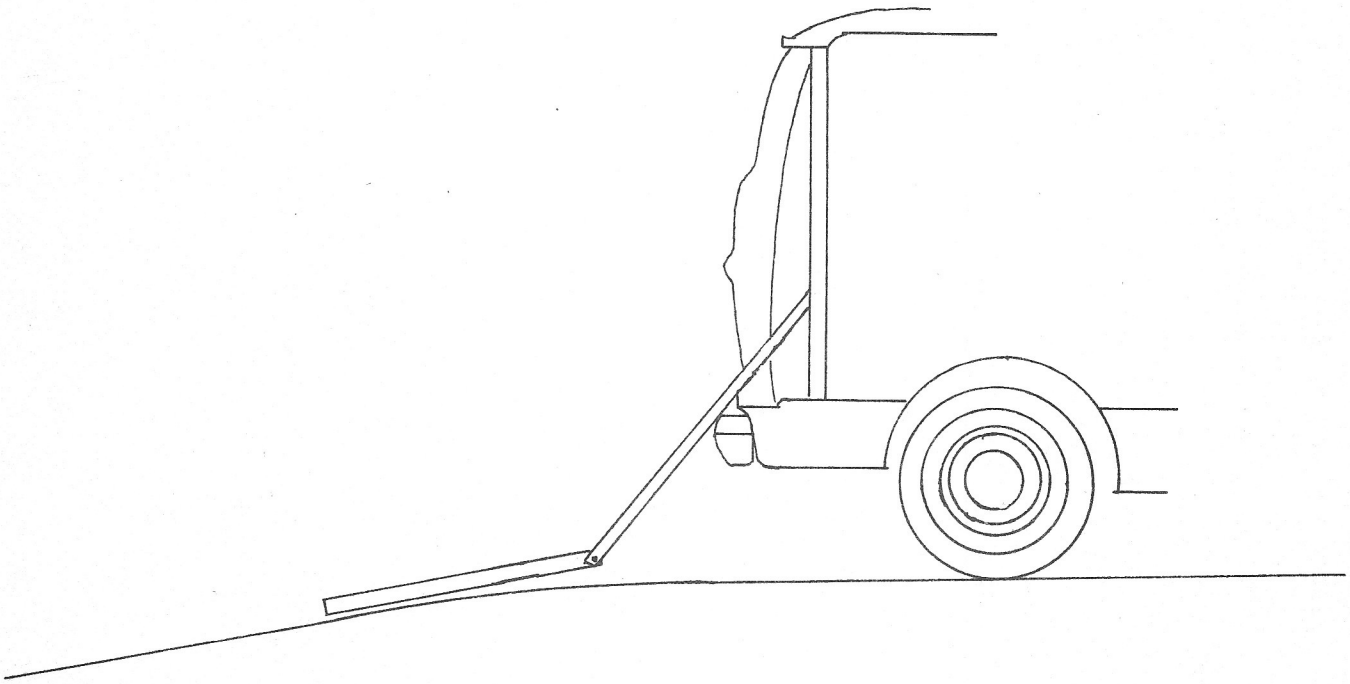


Figure LXVI

What happens is that you must extend the internal lift columns much more than normal. There is no nut on the bottom of the lift screws to prevent the internal lift columns from coming off of the screws. We have suggested in the past that the upper parts of the lift columns be painted red so that a person has a visual sign to tell him to stop lowering the platform. If you do run the interval lift columns off the screws you might just as well go back to step 4.2

6.0 (c) (continued)

and start over on the assembly.

7.0 Operating Procedure

1. Open rear doors.
2. Raise the platform with control - jog to raise it clear of the floor so that the yoke assembly can be swung outward.
3. Swing out the yoke assembly with one hand while reaching in between the door frame and the compression member with the other hand to lower the flop out.
4. Unfold the platform - take care to not drop the platform as you unfold it. Dropping the platform would be hard on the platform pins.
5. Lower the platform to the ground - when you get close to the ground stop and jog the control so that the platform does not hit the ground hard. Watch out for your feet too!
6. Roll the patient on to the platform - be sure he will not roll free.
7. Start to raise the platform - be sure the feet or the back of the chair will not hit the edge of the flop out as the patient is raised.
8. Stop when the back of the platform contacts the flop out.
9. Roll the patient on into the van.
10. Raise the platform a little higher.
11. Hold the platform - be careful to not get your coat caught.
12. With one hand pull out on the yoke and with the other reach between the compression member and the door frame and lift the flop out into the upright position. Then swing in the yoke.
13. Lower the folded platform until the foot pads hit the floor this prevents the yoke from swinging while the van is being driven.
14. Close the doors and you are ready to go.
15. To remove the patient start at step 1 and insert for step 5 the following: Lower the platform until it is level with the van floor, roll on the patient. Lower the platform and check to see that the patients feet or the large wheels on the wheelchair will clear the flop out.

8.0 Sources of Supply

1. Tubing 2 3/16" square by Telespare

2. Tubing 2 1/2" square by Telespare

   this tubing can be found at
   Unistrut Indianapolis, Inc.
   2719 Tobey Drive, City

3. Thrust bearing for screw assembly

   Andrews Ball Thrust Bearing
   GT - 3, found at Bearings, Inc.
   930 North Illinois St.

4. Screw Drive Sprocket

   Browing 35B18 - 3/8" - drill bore to 5/8" ID
   may be found at the Kenneth J. Galm Co., Inc.
   1301 W. 16th St.,City

5. Porous Bronze Bushing - screw bearing assembly

   Bunting P62-8 - Bearings, Inc.

6. Steel Bushing Stock

   1/2" ID and 5/8" OD - Kenneth J. Galm Co., Inc.

7. 1/2" dia - 13 thd rod - Service Supply Co., Inc.
   730 E. Washington, City

8. Porous Bronze Nut - Nut Assembly

   Bunting R P41-8, Bearings, Inc.

9. Motor Drive Sprocket & Idler Sprockets

   Browning 35B9 - drill out to 3/8" inside dia.
   Kenneth J. Galm Co., Inc.

10. Electric Motor

    See Paragraph 3.14

11. Roll Pins 1/8" dia., 1 - 13/16" long, 2 - 3/4" long

    Service Supply Co., Inc.

12. Porous Bronze Bushing - idler sprocket bearings

    Bunting R; P26-4, - Bearing, Inc.

13. 1/2" dia. drill rod - Kenneth J. Galm Co., Inc.

14. 3/8" roller chain 35RIV-10 feet

15. 3/8" links-2 required

9.0 Material List - Calculate from your measurements

1. 2 3/16" X 2 3/16" square tubing — all measurements in inches

Compression Members	2 X C = _____
Yoke Spacer	A-5 1/4= _____
Internal Lift Columns	2 X B = _____
	E + 2 1/2"
Platform Beams	2 X L = _____
Platform Spacer	A - 9 7/8"= _____
	Total _____

Multiply Total 1 X 1.1 for cutting loss _____

2. 2 1/2 X 2 1/2" square tubing
External Lift Columns — 2 X B = _____

3. Angle Iron - platform
1/8" thick X 3/4" X 3/4" length A -9" = _____ long
1/8" thick X 1/2" X 1/2" length A -9" = _____ long

4. Strap Iron - boss, flop out brace, etc.
1/8" thick 1" wide length 28 + 2 X F = _____

5. Bolts, nuts, screw & washers
1 - 1/4" threaded rod, nuts & washers for clamping
2 - 1/2" dia. screws - 13 threads per inch length 13-2 = _____
4 - nuts 1/2" dia. - 13 threads
2 - washers 1/2" ID - 3/4" OD
4 - bolts 1/4" dia. - 20 thds length 3/8"

6. Platform Floor - plywood
3/4" thick, A-9" wide + L-2" long

note: An alternative material for the platform is corrugated steel or "see through" steel type: walk way grating 3/8" diamond. This type of steel can be obtained in Indianapolis at the: Jones and Laughlin Steel Service
545 W. McCarty, City

The walk way grating steel design will require two inch flat steel bracing within the platform frame. In the past, we have used flat steel and angle (odds and ends) iron for bracing.

7. Steel Rod & Bushing Material
1" OD 2" long
bushing 1/2" ID, 5/8" OD, 6 inches long
Drill rod 1/2" dia. - 14 inches long

8. Steel plate (do not reduce thickness or width)
3/8" thick - 1 29/32 wide + 24 inches long
- 2 15/32 wide X 5 inches long
- 3 3/16" wide 6 1/2" long - foot pads
3/16" thick - 2 1/2" wide 7" long - motor mount
1/16" thick - 2 3/16" wide X 9 inches- compression attachment plates

9. Other Materials

1 - piano hinge A" Long
2 - 3/8" dia. bolts 2 3/4" long with nuts and lock washers - for attaching the compression columns to the roof beams .
4 - 3/8" dia. bolts of some length with lock washers and nuts attach the compression members to the van floor.
2 - 1/4" dia. machine bolts (hex heads) to hold the idler sprockets in place.

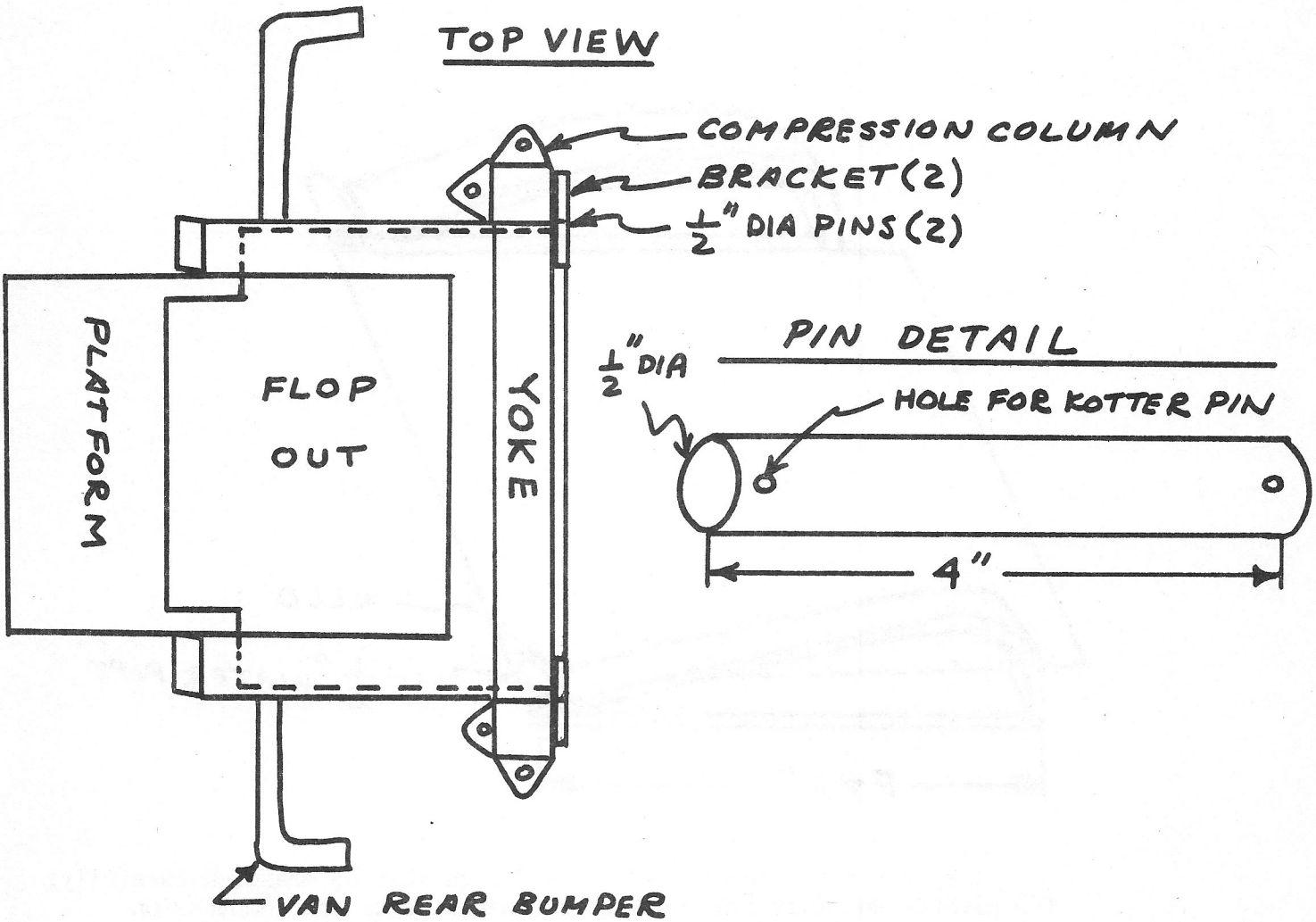
10. Flop Out Material

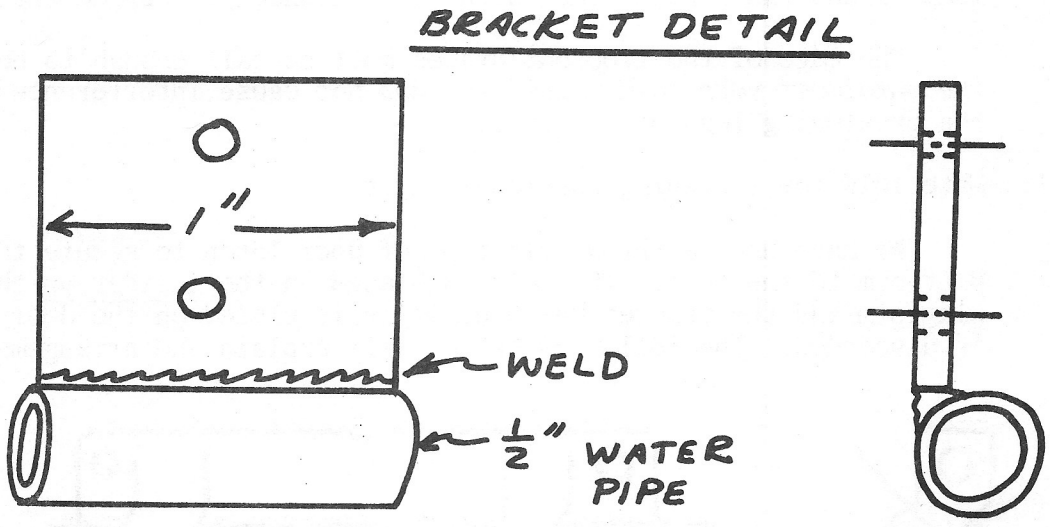
Page 24 contains the drawing of the flop out and page 23 (paragraph 3.9) shows the function of the flop out.

In the past, we have constructed a flop out and attached this member to the van floor (as shown in figure XLVIII), page 23. We have used the piano hinge and long sheet metal screws for attachment to the floor.

Invariably, the sheet metal screws work loose due to carpeting in vans. Also, there is a likelyhood of drilling into the gas tank (Dodge) on some vans or drilling into a structural floor member on a van (Cheverolet). We have in turn, dropped the gas tank and used machine screws, lockwashers and nuts to attach the piano hinge - flop out to the floor. Dropping the gas tank is a lot of work so the design of the flop out attachment has been changed.

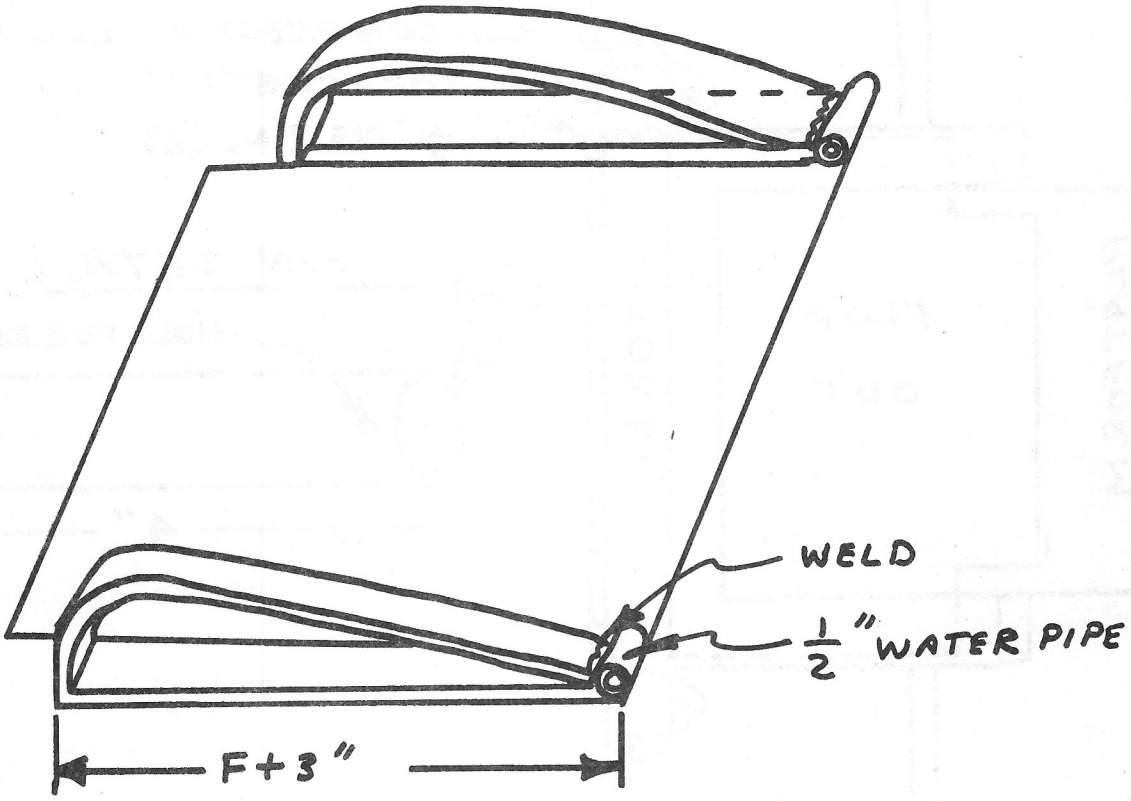
Presently, the flop out has been pinned to the compression members as shown in the following sketch:





*It may be necessary to pin the left-right shift or orientation of the flop out in addition to pinning the ends of each flop out pin. If it is necessary to fix the left-right shift of the flop out, cotter pins will be required between the brackets and flop out and additional holes for the cotter keys in the pins.

A sketch of the pinned flop out is shown as follows:

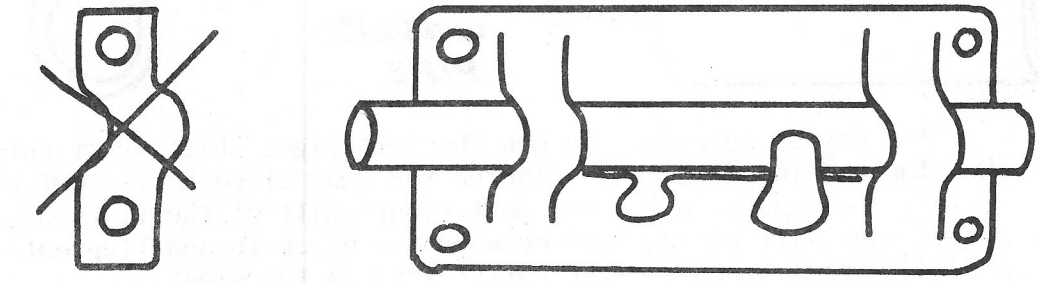


The (F + 3") dimension for this design must be measured carefully. The pivotal end must line up with the backside of the compression members and the edge of the notch must extend 1/2" beyond the bumper.

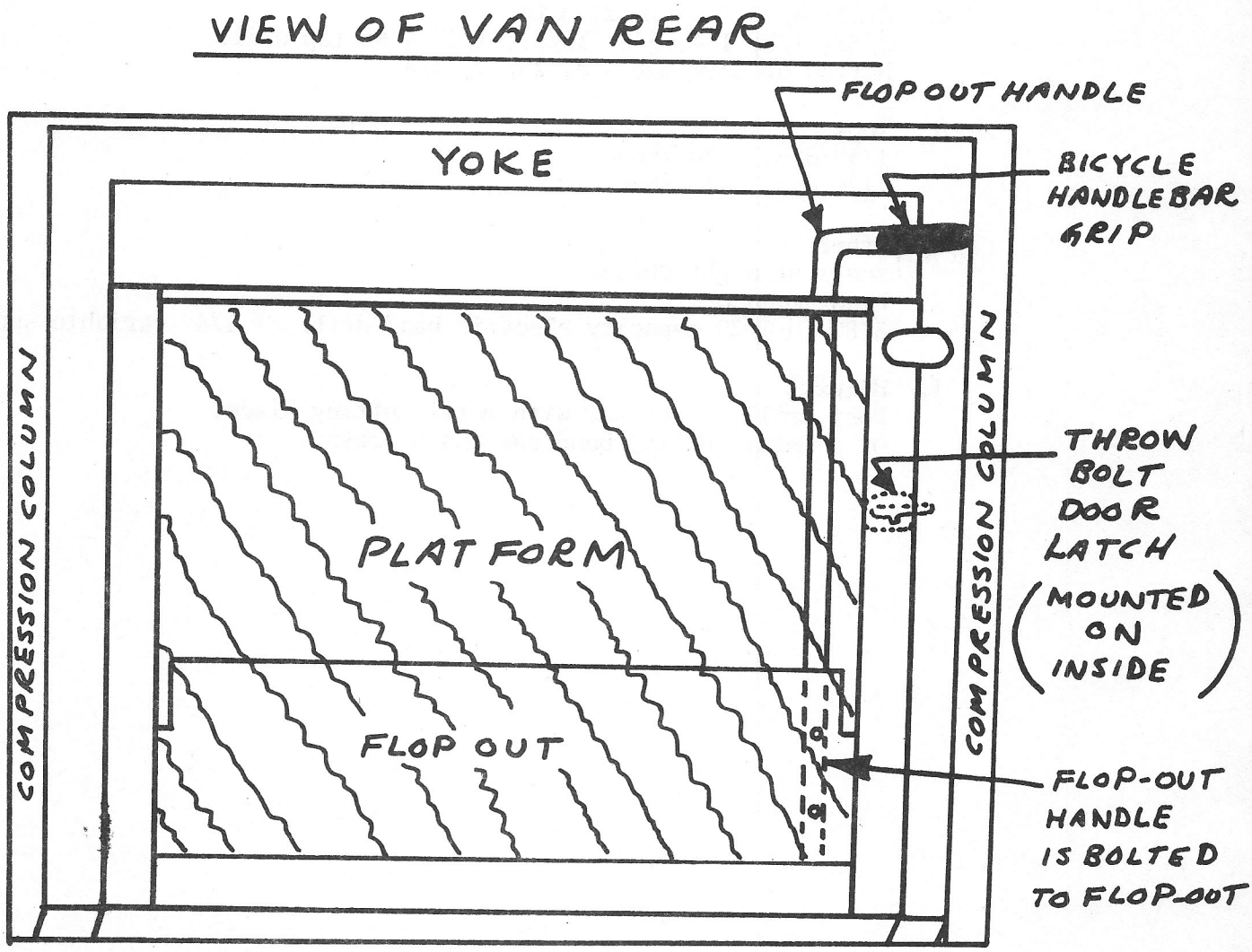
The edge of the flop out braces must be tall enough to hold the outermost yoke column members, and not cause interference with the protruding legs of the yoke.

11. Materials for finishing Wheelchair Lift

We have used a throw bolt type of door latch to secure the platform to the yoke. The bolt is placed on the insider on the platform and the bracket which normally is placed on the door jamb is discarded. The following sketch will explain the arrangement:



We also make a handle for the flop out. We use 1/2" conduit and bend it so that the handle is out of the way when the wheelchair lift is folded up inside the van. The following sketch will show the handle and throw bolt on the lift:



12.0 Necessary Tools

a. Measurement and Layout
tape measure
Machinest square
Protractor
scriber
hammer
prick punch
center punch

b. Files
1-12" flat bastard
1-12" half round bastard
1-12" round 1/2" dia.
1-9" round 1/4" dia.

c. Drill bits inch in diameter
3/32, 1/8, 1/4, 3/8, 15/32, 1/2" & #8 tap drill
borrow or farm out 5/8, 23/32, 3/4

d. Tops
1/4" dia. - 20 thds
1/2" dia. - 13 thds

e. Other
small straight chisel
hand hacksaw
3/8" to 1/2" capacity electric hand drill or 1/4" variable speed hand drill

f. Helpful
Post drill, saber saw with metal cutting blade,
or a metal cutting band saw and a press.